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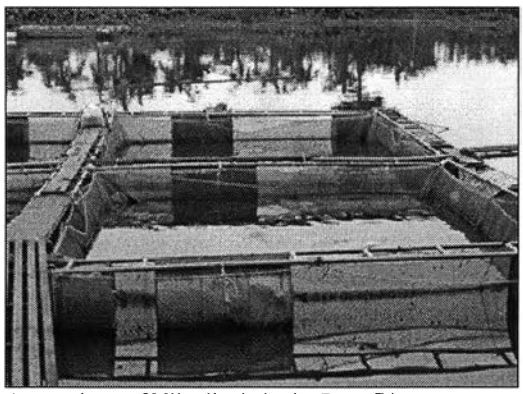
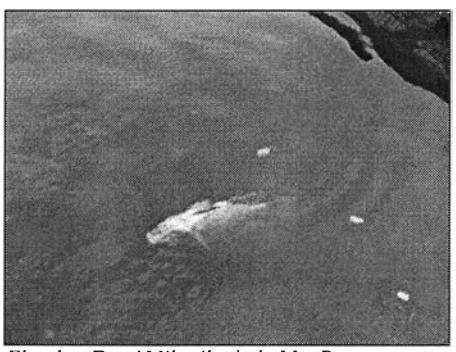
APPENDICES

APPENDIX A

Fish Kills in Aquaculture

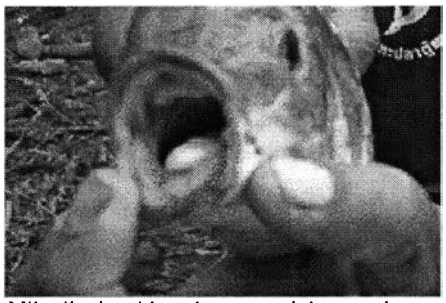


Aquaculture of Nile tilapia in the Pong River



Floating Dead Nile tilapia in Net Pen

Annual Fish Kill of Nile tilapia with Varying Intensity (Notice Red Rashes in the Heads)



Nile tilapia with rashes around the mouth.

Nile tilapia with rashes around the tail.

Nile tilapia with Popped-Out Eyes

Nile tilapia with Cloudy Eyes

APPENDIX B

INDUSTRIAL EFFLUENT STANDARD

Source: Notification of the Ministry of Industry, No. 13 B.E. 2525 (1982), as amended in No. 22 B.E. 2528 (1985), issued under the Factory Act B.E. 2512 (1969), published in the Royal Gazette, Vol. 99, Part 89, dated June 29, B.E. 2525 (1982).

Industrial Effluent Standards		
Parameters	**Units**	**Standard Values**
1. pH	-	5.5-9.0
2. Total Dissolved Solids (TDS)	mg/l	• not more than 3,000 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 5,000 mg/l • not more than 5.000 mg/l exceed TDS of receiving water having salinity of more than 2,000 mg/l or TDS of sea if discharge to sea
3. Suspended solids (SS)	mg/l	not more than 50 mg/l depending on receiving water or type of industry or wastewater treatment system under consideration of PCC but not exceed 150 mg/l
4. Temperature	°C	not more than 40
5. Color and Odor	-	not objectionable
6. Sulphide (as H_2S)	mg/l	not more than 1.0
7. Cyanide (as HCN)	mg/l	not more than 0.2
8. Fat. Oil & Grease (FOG)	mg/l	not more than 5.0 mg/l depending of receiving water or type of industry under consideration of PCC but not exceed 15.0 mg/l
9. Formaldehyde	mg/l	not more than 1.0
10. Phenols	mg/l	not more than 1.0
11. Free Chlorine	mg/l	not more than 1.0
12. Pesticides	mg/l	not detectable
13. Biochemical Oxygen Demand (BOD)	mg/l	not more than 20 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 60 mg/l
14. Total Kjedahl Nitrogen (TKN)	mg/l	not more than 100 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 200 mg/l
15. Chemical Oxygen Demand (COD)	mg/l	not more than 120 mg/l depending on receiving water of type of industry under consideration of PCC but not exceed 400 mg/l
16. Heavy metals 1. Zinc (Zn)	mg/l	not more than 5.0
2. Chromium (Hexavalent)	mg/l	not more than 0.25
3. Chromium (Trivalent)	mg/l	not more than 0.75
4. Copper (Cu)	mg/l	not more than 2.0
5. Cadmium (Cd)	mg/l	not more than 0.03
6. Barium (Ba)	mg/l	not more than 1.0
7. Lead (Pb)	mg/l	not more than 0.2
8. Nickel (Ni)	mg/l	not more than 1.0
9. Manganese (Mn)	mg/l	not more than 5.0
10. Arsenic (As)	mg/l	not more than 0.25
11. Selenium (Se)	mg/l	not more than 0.02
12. Mercury (Hg)	mg/l	not more than 0.005

Remark: 1)PCC Pollution Control Committee

2) The standards were summerized from the Notification of the Ministry of Science, Technology and Environment, No. 3, B.E. 2539 (1996) and it specifies that pollution sources that the above standards are

to be applied are factories group II and III issues under the Factory Act B.E.2535 (1992) and every kind of industrial estates.

3) Notification of the Pollution Control Committee, No. 3, B.E. 2539 (1996) dated August 20, B.E. 2539 (1996) has issued types of factories (category of factories issued under the Factory Act B.E.2535 (1992) that are allowed to discharge effluent having different standards from the Ministerial Notification No. 3 above as follows :

1. BOD up to 60 mg/l
    - animal furnishing factories (category 4 (1))
    - starch factories (category 9 (2))
    - food from starch factories (category 10)
    - textile factories (category 15)
    - tanning factories (category 22)
    - pulp and paper factories (category 29)
    - chemical factories (category 42)
    - pharmaceutical factories(category 46)
    - frozen food factories (category 92)
2. COD up to 400 mg/l
    - food furnishing factories (category 13 (2))
    - animal food factories (category 15 (1))
    - textile factories (category 22)
    - pulp and paper factories (category 38)
3. TKN
    - 100 mg/l - effective after 1 year from the date published in the Royal Government Gazette of the Ministerial Notification No. 4
    - 200 mg/l - effective after 2 year from the date published in the Royal Government Gazette of the Ministerial Notification No. 4 for the following factories:
        1. food furnishing factories (category 13 (2))
        2. animal food factories (category 15 (1))

Sources:

1. Notification the Ministry of Science, Technology and Environment, No. 3, B.E.2539 (1996) issued under the Enhancement and Conservation of the National Environmental Quality Act B.E.2535 (1992), published in the Royal Government Gazette, Vol. 113 Part 13 D, dated February 13, B.E.2539 (1996)
2. Notification the Ministry of Science, Technology and Environment, No. 4, B.E.2539 (1996) issued under the Enhancement and Conservation of the National Environmental Quality Act B.E.2535 (1992), published in the Royal Government Gazette, Vol. 113 Part 13 D, dated February 13, B.E.2539 (1996)
3. Notification of the Pollution Control Committee, No. 3, B.E. 2539 (1996) dated August 20, B.E. 2539 (1996) issued under Factory Act B.E.2535 (1996), published in the Royal Gazette, Vol. 113, Part 75 D, dated September 17, B.E. 2539 (1996)

APPENDIX C

WATER QUALITY STANDARD CLASS 3 FOR THE PONG RIVER

Source: Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992), published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994).

Surface Water Quality Standards

Parameter	Units	Statistics	Standard Value for Class					Methods for Examination
			Class 1	Class 2	Class 3	Class 4	Class 5	
1. Color, odor, taste	-	-	n	n	n	n	-	-
2. Temperature	C°	-	n'	n'	n'	n'	-	Thermometer
3. pH	-	-	n	5-9	5-9	5-9	-	Electrometric pH Meter
4. Dissolved Oxygen	mg/l	P20	n	6	4	2	-	Azide Modification
5. BOD (5 days, 20°C)	mg/l	P80	n	1.5	2.0	4.0	-	Azide Modification at 20 ° C , 5 days
6. Coliform bacteria								Multiple Fermentation Technique
- Total coliform	MPN/100 ml	P80	n	5,000	20,000	-	-	
- Fecal coliform	MPN/100 ml	P80	n	1,000	4,000	-	-	
7. NO_3 -N	mg/l	Max. allowance	n	0.5			-	Cadmium Reduction
8. NH_3-N	mg/l	-	n	0.5			-	Distillation Nesslerization
9. Phenols	mg/l	-	n	0.005			-	Distillation,4-Amino antipyrene
10. Copper (Cu)	mg/l	-	n	0.1			-	Atomic Absorption - Direct Aspiration
11. Nickle (Ni)	mg/l	-	n	0.1			-	Atomic Absorption - Direct Aspiration
12. Manganese (Mn)	mg/l	-	n	1.0			-	Atomic Absorption - Direct Aspiration
13. Zinc (Zn)	mg/l	-	n	1.0			-	Atomic Absorption - Direct Aspiration
14. Cadmium (Cd)	mg/l	-	n	0.005* 0.05**			-	Atomic Absorption - Direct Aspiration
15. Chromium Hexavalent	mg/l	-	n	0.05			-	Atomic Absorption - Direct Aspiration
16. Lead (Pb)	mg/l	-	n	0.05			-	Atomic Absorption - Direct Aspiration
17. Total Mercury	mg/l	-	n	0.002			-	Atomic Absorption-Cold Vapour Technique
18. Arsenic (As)	mg/l	-	n	0.01			-	Atomic Absorption-Gaseous Hydride
19. Cyanide (CN)	mg/l	-	n	0.005			-	Pyridine-Barbituric Acid
20. Radioactivity -Alpha -Beta	Becqurel/l Becqurel/l	- -	n n	0.1 1.0			- -	Low Background Proportional Counter
21.Total Organochlorine Pesticides)	mg/l	-	n	0.05			-	Gas-Chromatography
22. DDT	µg/l	-	n	1.0			-	Gas-Chromatography

23. Alpha-BHC	µg/l	-	n	0.02	-	Gas-Chromatography
24. Dieldrin	µg/l	-	n	0.1	-	Gas-Chromatography
25. Aldrin	µg/l	-	n	0.1	-	Gas-Chromatography
26. Heptachlor & Heptachlorepoxide	µg/l	-	n	0.2	-	Gas-Chromatography
27. Endrin	µg/l	-	n	none	-	Gas-Chromatography

Remark :

P	Percentile value
n	naturally
n'	naturally but changing not more than 3 ° C
*	when water hardness not more than 100 mg/l as $CaCO_3$
**	when water hardness more than 100 mg/l as $CaCO_3$
Based on	Standard Methods for the Examination of Water and Wastewater recommended by APHA : American Public Health Association, AWWA : American Water Works Association and WPCF : Water Pollution Control Federation

Source: Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992), published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994).

APPENDIX D

Daily Rainfall from two stations and total daily runoff (RO) into the river segment in 1999.

Daily Rainfall from two stations and total daily runoff (RO) into the river segment in 1999.

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG	
Day	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)
1	0.0	0	0.0	0.7	0.0	0	0.0	1.6	0.0	1.04	0.0	7.75	13.3	0	2.3	0
2	0.0		-1.1	0	0.0	0	0.0	1.6	0.0	0	0.0	8.56	47.2	0	0.6	0
3	0.0		0.0		0.0	0	0.0	1	0.0	0	0.0	0	28.9	7.64	-1.1	23
4	0.0	0	0.0		0.0	0	0.0	1.9	63.5	0	84.1	5.9	3.6	0	0.1	0
5	0.0	0	0.0	0.8	0.0	5.3	0.0	0	18.4	1.27	0.0	10.2	24.7	7.99	-1.1	0
6	0.0	4.6	0.0	3.5	0.0	13	0.0	0	3.6	0	0.0	9.3	1.3	0	0.0	28.4
7	0.0	3.2	0.0	2.9	0.0	11	0.0	0.8	20.5	2.08	0.4	10.5	0.0	12.7	-1.1	46.2
8	0.0	0	0.0	2.5	0.0	11	11.8	0	10.0	8.33	0.0	9	0.0	26.2	0.0	0
9	0.0	0	0.0	3	0.0	0	0.0	0	45.6	24.5	42.9	6.8	0.4	48	0.0	0
10	0.0	0	0.0	2.1	0.0	0	35.1	0	0.5	35.9	0.8	9	3.7	0	13.9	0
11	-1.1	0	0.0	0	0.0	0	1.9	0	-1.1	60.9	-1.1	9	0.0	52.9	0.0	26.7
12	3.3	0	0.0	2.2	0.0	0	0.9	0	0.2	52.1	0.0	11	0.0	0	0.6	23.5
13	0.0	0	0.0	1.5	0.0	0.2	0.3	0	9.0	40	-1.1	11	0.0	67.7	-1.1	21.6
14	-1.1	0	0.0	1.9	0.0	0	13.7	0	3.1	62.5	-1.1	12	0.0	0	0.0	26.5
15	0.0	0	0.0	2.7	2.0	0.5	19.5	0	24.9	40.7	4.3	14.5	0.6	0	5.3	23
16	0.0	0	0.0	0	-1.1	0	-1.1	0	0.0	27	2.2	5	0.0	20.5	1.0	0
17	0.0	0	0.0	0	0.0	0	1.3	0	8.0	18.5	0.8	5	-1.1	3.94	21.4	36
18	0.0	0	0.0	0	0.0	0	56.4	2.8	0.0	14.4	0.0	0	0.0	5.8	0.2	31
19	0.0	0	0.0	0	0.0	0	0.1	0	0.0	11	28.9	0	-1.1	101	1.5	34.1
20	0.0	0	0.0	0	0.0	0	22.6	0	3.4	8.45	26.7	0	0.0	0	-5.6	17.1
21	0.0	0	0.0	0	0.1	0	0.0	17	54.5	9.72	0.7	0	0.0	0	0.0	16
22	0.0	0	0.0	0	23.7	0	0.0	7.4	0.5	12	0.0	0	0.2	0	0.9	16.3
23	0.0	0	0.0	0	0.0	0	2.6	6	0.3	14	49.5	0	2.2	0	4.8	0
24	0.0	3.2	0.0	0	23.1	0	0.0	3.8	0.0	20	49.5	0	1.2	0	2.2	0
25	0.0	3.4	0.0	0	4.3	0	0.0	0.7	1.1	22	49.8	0	7.8	0	0.0	15.5
26	0.0	6.3	0.0	0	0.3	0	21.9	7.9	0.0	18.4	49.5	0	0.1	0	1.2	5.32
27	0.0	6.1	0.0	0	-1.1	0	1.2	6.6	1.3	13.3	12.5	0	-1.1	0		
28	0.0	11	0.0	0	10.8	0	0.0	3.2	1.1	12	0.0	0	0.7	0		
29	0.0	10			0.0	5	0.0	2	1.8	11.2	0.0	0	5.5	0		
30	0.0	11			0.0	1.9	0.0	0.2	-1.1	8.9	24.4	0	8.9	0		
31	0.0	11			0.0	1.6			0.3	9.26			7.8	0		

-1.1 immeasurable.

Rain data calculated from two meteorological stations, Ta Pra and Khon Khan.

APPENDIX E

Daily Rainfall from two stations and total daily runoff into the river segment in 2000.

Appendix E Daily Rainfall from two stations and total daily runoff into the river segment in 2000.

	JAN		FEB		MAR		APR		MAY		JUN	
Day	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)
1	0.0	0.0	0.0	0.69	2.0	0.0	0.0	7.52	1.7	0.0	40.4	20.4
2	0.0	0.0	0.0	0.81	-1.1	0.0	0.0	7.64	0.5	0.0	2.8	21.9
3	0.0	0.0	0.0	0.0	1.1	0.0	0.0	8.1	23.5	39	1.2	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.71	25.8	19.3	0.2	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.95	0.3	12.7	0.0	0.0
6	0.0	1.5	0.0	0.0	0.0	0.0	0.0	10.4	3.3	13.9	-1.1	0.0
7	0.1	0.46	0.0	0.0	0.0	0.23	2.9	10.5	0.0	14.8	0.0	4.86
8	-1.1	0.23	0.0	0.0	0.0	0.0	0.0	10.1	0.0	8.56	27.3	0.0
9	-1.1	0.35	0.0	0.0	0.6	0.0	0.0	10.6	0.0	14.8	0.0	22.6
10	0.0	0.0	0.0	0.0	0.0	0.0	49.2	12.8	35.6	8.91	0.0	3.59
11	0.0	0.69	0.0	0.69	0.0	1.39	1.3	27.4	3.3	41.7	0.0	9.03
12	0.0	0.3	0.0	0.0	0.0	5.79	0.7	17.1	23.2	3.36	6.3	7.99
13	0.0	0.0	0.0	0.0	0.0	1.5	10.3	14.7	10.7	16.7	0.0	4.98
14	0.0	0.0	0.0	0.0	0.0	2.2	11.4	8.56	25.5	10.6	0.0	0.0
15	0.0	0.0	0.0	2.55	0.0	2.08	43.8	13.7	3.2	10.3	8.2	0.58
16	0.0	0.0	0.0	7.18	0.0	3.94	2.5	13.5	0.9	12.3	23.9	2.43
17	0.0	0.0	-1.1	7.18	0.0	3.82	0.0	0.0	0.0	17.7	47.1	6.02
18	0.0	0.0	1.4	10.5	0.0	7.41	0.0	0.0	6.4	16	5.3	5.9
19	0.0	0.12	0.6	0.23	0.0	4.17	15.5	5.67	56.9	6.83	24.6	8.56
20	0.0	0.69	0.9	11.2	0.0	2.55	2.9	16	40.7	16	1.0	31.8
21	0.0	0.0	16.8	2.31	0.0	5.56	-1.1	19.2	1.1	11.5	0.2	39.4
22	0.0	0.0	0.0	0.0	0.0	3.24	36.8	14.2	0.0	18.2	0.7	10.9
23	0.0	0.0	0.0	5.67	-1.1	0.46	0.0	7.64	2.9	0.0	27.3	7.99
24	0.0	0.0	2.2	0.12	0.0	3.24	0.0	7.75	-1.1	1.27	39.3	10.3
25	0.0	0.0	0.0	0.0	0.0	2.43	3.0	9.72	0.0	1.85	0.0	12.8
26	0.0	0.0	0.0	0.0	0.0	6.71	5.3	15	0.0	43.1	0.0	16.7
27	0.0	0.0	0.0	0.0	0.0	3.82	19.9	28.6	0.0	49.3	0.0	22.6
28	0.0	0.0	0.0	0.0	0.0	4.17	0.0	28	0.0	52.9	0.0	25.3
29	0.0	0.0	3.7	0.0	0.0	6.83	20.7	52.5	2.4	16.4	0.2	7.52
30	0.0	0.0			0.0	6.83	0.0	40	0.7	9.49	41.5	6.02
31	0.0	0.69			8.6	12.6			0.0	22.2		

-1.1 immeasurable.

	JUL		AUG		SEP		OCT	
Day	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)	Rain (mm)	RO (cms)
1	45.0	4.63	0.1	33	-1.1	15.3	-1.1	8.2
2	0.0	11.6	0.4	31.6	1.5	15.2	1.8	0
3	0.0	13.3	11.0	31.7	1.1	14	0.0	0
4	2.7	8.45	14.8	30.9	8.0	14.1	0.0	0.8
5	12.7	0.0	8.2	30.7	13.9	23.4	7.0	0
6	27.9	0.0	0.0	27.9	2.1	17.4	0.0	0
7	0.0	0.0	74.5	34.5	8.9	12.4	0.7	18
8	0.0	0.0	11.9	41.6	3.3	13.9	0.8	0
9	-1.1	6.02	0.5	44.6	0.0	12.7	0.0	0
10	12.5	2.31	0.0	67.7	114.5	12.8	0.0	0
11	19.1	21.6	0.0	14.9	26.7	23.3	0.0	0
12	17.8	29.2	2.0	86.9	-1.1	36.6	5.9	0
13	0.1	40.6	6.0	76.3	29.2	45.4	0.0	3.8
14	0.0	61.9	0.0	60.8	12.7	47.2	0.0	0
15	0.9	65.2	-1.1	46.2	0.0	44	0.0	0
16	0.9	43.3	-1.1	44.2	0.0	53	-1.1	0
17	-1.1	26.3	-1.1	27.9	0.0	102	-1.1	0
18	5.9	20	28.6	30.3	0.0	0	0.0	0
19	-1.1	4.17	-1.1	20.6	-1.1	14.5	0.0	0
20	0.0	83	2.7	20.1	0.0	8.56	-1.1	3
21	0.0	70.4	0.0	22.5	-1.1	9.95	42.8	6.1
22	0.5	43.2	38.5	16.2	0.0	0	18.7	5.3
23	5.6	29.6	106.9	27.9	8.3	0	2.8	29
24	27.7	24.4	20.8	25	0.3	0	0.9	18
25	2.4	33.6	13.0	27.4	9.6	0	0.0	13
26	6.7	37	4.4	19	0.1	0	0.0	11
27	9.3	35	24.3	19.2	1.1	0	0.0	24
28	0.7	33.8	0.0	21.9	0.0	0	10.7	19
29	5.0	27	-1.1	17.6	0.0	0	0.0	15
30	0.5	33.3	0.1	16.2	15.3	0		
31	0.5	33.4	8.5	16.4				

APPENDIX F

Daily mean dry temperature in 1999 (^{0}C)

Appendix F Daily mean dry temperature in 1999 (^{0}C)

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	25.2	29.3	26.5	30.1	28.7	29.1	28.0	26.5	27.9	27.7	26.7	21.9
2	24.5	29.5	27.9	31.4	29.3	29.1	27.3	26.0	27.1	26.4	23.2	21.7
3	22.6	25.4	29.2	30.6	29.9	29.9	26.9	27.8	28.1	26.1	22.4	21.1
4	21.7	21.9	28.1	30.7	27.8	28.7	26.6	27.1	28.0	26.4	23.5	23.1
5	21.1	21.1	29.6	28.3	26.4	28.0	26.3	26.4	27.7	27.9	23.2	23.1
6	20.3	22.1	30.8	27.3	27.4	29.7	26.2	27.7	27.5	28.4	24.1	22.4
7	21.3	23.5	31.0	29.3	26.5	29.4	28.9	27.6	26.5	28.5	23.8	22.4
8	21.2	23.8	30.8	27.8	27.0	29.4	29.1	28.8	25.9	26.1	25.8	22.0
9	21.7	23.4	30.4	29.2	25.8	28.6	29.5	29.2	26.7	26.8	26.8	21.0
10	22.9	24.2	30.1	28.0	23.8	26.7	28.5	28.4	25.7	27.1	27.1	20.7
11	23.6	26.0	31.0	26.3	25.0	26.6	28.9	27.7	26.6	27.1	27.8	22.1
12	19.6	26.1	32.6	27.2	24.5	28.3	28.3	26.5	26.4	27.6	28.5	22.6
13	19.9	26.0	32.9	28.2	25.6	28.7	28.2	27.1	26.4	28.3	26.4	23.7
14	22.8	25.8	32.9	27.4	27.1	29.7	28.9	26.9	28.1	27.0	27.2	24.1
15	22.4	26.0	30.7	26.3	27.9	28.4	29.5	26.7	27.4	26.9	26.6	22.4
16	21.4	26.2	30.6	26.6	27.5	27.7	28.8	27.7	26.3	25.5	25.3	23.2
17	21.8	26.3	32.2	29.0	26.5	27.3	29.5	26.7	26.8	26.2	24.7	23.7
18	22.5	27.8	31.9	28.0	28.3	28.8	28.5	26.4	26.8	24.6	23.7	22.8
19	24.2	27.0	31.0	27.7	27.6	26.5	28.7	27.3	27.8	24.0	22.5	21.3
20	24.9	25.2	32.0	26.6	27.6	26.0	28.9	27.6	26.4	20.9	22.7	19.6
21	24.9	24.5	32.9	28.1	26.0	27.2	28.9	29.4	26.1	23.9	22.8	18.2
22	25.3	23.9	25.9	28.3	27.8	27.9	29.0	29.0	27.2	25.8	24.4	16.6
23	26.1	25.7	25.6	27.3	28.8	-	27.9	29.0	25.7	26.8	25.9	14.0
24	25.6	27.8	27.4	29.0	29.3	-	27.1	27.2	26.2	25.4	27.2	13.8
25	24.8	28.7	27.1	29.7	29.3	-	25.7	27.5	27.7	25.7	27.3	
26	25.4	30.1	29.9	30.3	29.1	-	26.2	28.3	27.2	26.7	26.5	15.4
27	26.7	30.5	31.2	28.8	28.9	27.4	27.9	26.6	27.6	25.9	26.6	17.3
28	26.9	27.9	26.9	27.8	27.7	28.9	28.0	27.4	27.5	26.6	26.2	19.5
29	26.9		27.7	27.0	28.2	30.3	28.6	27.2	26.9	26.7	24.4	22.1
30	27.5		27.6	28.3	28.9	30.6	27.4	25.6	27.4	27.3	21.6	23.9
31	28.8		28.6		28.1	25.8	27.0	26.0				25.2

APPENDIX G

Water Temperatures Reported in 1999 and 2000 Studies.

Water Temperatures Reported in 1999 and 2000 Studies.

For model calibration with 1999 data		For model validation with 2000 data	
Date	Value (^{0}C)	Date	Value (^{0}C)
12/25/1998	22	12/30/1999	20.3
1/4/1999	22	1/6/2000	23.2
1/11/1999	22	1/13/2000	21
1/18/1999	22	1/20/2000	20
1/25/1999	23	1/27/2000	21.4
2/1/1999	22	2/3/2000	20.6
2/8/1999	22	2/10/2000	21.1
2/15/1999	24	2/17/2000	23
2/22/1999	24.5	2/24/2000	27.8
3/1/1999	25	3/2/2000	21.9
3/8/1999	28	3/9/2000	23.5
3/15/1999	29	3/16/2000	26.9
3/22/1999	26.5	3/23/2000	29.2
3/29/1999	28.5	3/30/2000	26
4/5/1999	27	4/6/2000	28.5
4/11/1999	29	4/10/2000	29.2
4/19/1999	29.5	4/20/2000	28.9
4/26/1999	30	4/27/2000	29.5
5/3/1999	31	5/4/2000	29
5/10/1999	28	5/11/2000	29.2
5/14/1999	29	5/18/2000	30
5/17/1999	29	5/25/2000	30.5
5/24/1999	30	6/1/2000	30
5/31/1999	31	6/8/2000	31
6/7/1999	30	6/15/2000	29
6/14/1999	30	6/22/2000	29.8
6/25/1999	30	6/29/2000	30
6/30/1999	31	7/6/2000	29.5
7/7/1999	30.5	7/10/2000	29
7/14/1999	30.5	7/17/2000	29
7/21/1999	32	7/24/2000	29.2
7/28/1999	30	7/31/2000	30.5
8/4/1999	30.2	8/7/2000	29.5
8/11/1999	30	8/14/2000	31
8/18/1999	29	8/21/2000	31
8/25/1999	30	8/28/2000	29
		9/4/2000	29
		9/11/2000	28.5
		9/18/2000	28
		9/25/2000	30
		10/1/2000	29

		10/8/2000	29.5
		10/15/2000	29
		10/23/2000	28
		10/29/2000	28

Appendix H

EGAT Cross Sectional Areas and Sampling Locations

EGAT Cross Sectional Areas and Approximate Sampling Locations.

Distance from Dam (km)	EGAT Cross Sectional Area (m^2)	Sampling Location
0		Dam
0.3		
0.4	514	Below Bridege (Pong2)
1.7	514	Known Soong (NS)
2.7	488	
3.7	404	
4.2		Known Jik (NJ)
4.7	538	
5.7	464	
6.7	437	
7.7	405	Segment3
8.7	709	
9.7	526	Nong Pur (NP)
10.7	382	
11.7	405	
12.7	430	
13.7	420	
14.7	406	
15.7	526	
16.7	429	Kum Bon (KB)
17.7	470	
18.7	519	
19.7	445	Pumping St (PS)
20.7	732	
21.7	485	
22.3	450	Chot (CT)
22.7	435	
23.7	620	
24.7	548	
25.1	548	Sua Ten (ST)
25.7	552	
26.7	541	
27.7	880	Kum Pae/Bua Noi
28.7	600	(KP/BN)
29.7	608	
30.7	508	
31.7	699	Segment11
32.7	682	
33.7	752	
34.7	810	
35.7	810	Nong Wai

APPENDIX I

Initial conditions of each segment in this study.

Segment	Description	Volume	Velocity Multiplier*[1]	Depth Multiplier	Segment Type	Bottom Segment
1	NS	1,500,000	3,167	9.7	Surface	B1
2	NJ	1,500,000	3,163	9.7	Surface	B2
3	Sgmt3	1,500,000	2,820	9.7	Surface	B3
4	NP	1,500,000	3,556	9.7	Surface	B4
5	KB	1,500,000	3,450	9.6	Surface	B5
6	PS	1,500,000	3,166	9.6	Surface	B6
7	CT	1,500,000	2,680	9.5	Surface	B7
8	Sgmt8	1,500,000	3,208	9.6	Surface	B8
9	ST	1,500,000	2,854	10.4	Surface	B9
10	KP/BN	1,500,000	2,727	10.7	Surface	B10
11	Sgmt11	1,500,000	2,386	10.9	Surface	B11
12	Sgmt12	1,500,000	2,232	11	Surface	B12
13	B1	2,362*[2]	0	0.1	Surface Benthic	None
14	B2	3,333	0	0.1	Surface Benthic	None
15	B3	4,042	0	0.1	Surface Benthic	None
16	B4	4,323	0	0.1	Surface Benthic	None
17	B5	4,323	0	0.1	Surface Benthic	None
18	B6	4,323	0	0.1	Surface Benthic	None
19	B7	4,603	0	0.1	Surface Benthic	None
20	B8	843	0	0.1	Surface Benthic	None
21	B9	3,574	0	0.1	Surface Benthic	None
22	B10	459	0	0.1	Surface Benthic	None
23	B11	1,678	0	0.1	Surface Benthic	None
24	B12	1,826	0	0.1	Surface Benthic	None

*1 Velocity Multiplier = Flow during measurement/Cross sectional area*3,600*24

*2 Benthic Volume = 0.1 * Length * Width (m^3)

Appendix J

Calculation of Ammonia Loading from Aquaculture

The feed formulation was 30% protein, as labeled on the feed package. The composition of nitrogen in protein is 16.5% (Hargreaves, 2003). For 1000 fingerlings of approximately 50 grams each, 6 kilograms of feed were fed daily. For 1000 grown-up fish, 20 kilograms were fed daily. Therefore, the average feed of 13 kg [(20+60)/2] were fed to 1000 fish daily.

Assuming that 100% of feed were eaten by fish, the total protein consumed daily could be calculated by multiplying the total feed by 30%. The total nitrogen consumed could be obtained by multiplying the total protein by 0.165. If only 75% of nitrogen was released from the fish, then the released protein could be determined by multiplying the total N consumed by 0.75. Since the composition of released protein was 80% NH_3-N, the NH3-N released to the environment was determined by multiplying the total N released by 80%.

Location	Segment	No of Fish	Total feed of 30% protein (kg/day)	Total N consumed (kg/day)	Total N released (kg/day)	NH_3-N released (kg/day)
Huai Sai	2	10,000	130	6.44	4.8	3.9
Chot	7	80,000	1040	51.5	38.6	30.9
Sua Ten	9	200,000	2600	128.7	96.5	77.2
Bua Noi	10	100,000	1300	64.4	48.3	38.6

Appendix K

Materials and Methods for Phenols Analysis

Materials and Methods for Phenols Analysis

The chemicals used were: phenol (Merch, 99.5% pure), ammonium chloride (Merck, 99.8%), 4-amino-2,3-dimethyl-1-phenyl-3-pyrazoline-5-one (Merch, 99%), potassium hexacyanoferate (Merch, 99%), chloroform (Fisher, HPLC grade), sodium sulfate (Carlo Erba, 99.8%) and 25% ammonia solution (Merch, analytical grade)

The followings are the cleanup, quality control, and analytical methods for measuring phenols.

Cleanup Procedure:

1. 500-mL water sample in a distilling flask is adjusted to pH 4.0 with H_3PO_4 solution using methyl orange indicator or a pH meter and distilled. After the sample has been distilled for 450 mL, 50 mL of warm water was added to the flask and the distillation is continued until 500 mL of distillate is collected.
2. If the distillate is still turbid, it must be added with H_3PO_4 and distilled again. If the second distillate is turbid again, the phenols must first be extracted out of the water sample with chloroform and then re-extracted out of the chloroform with an alkaline solution, as described in Method 5530B

Quality Control:

1. A separate experiment is performed as the above procedure with pure water as a control. The intensity obtained at 460 nm of the sample must be subtracted with that of the control before comparing with the standard curve.
2. If the filtrate is turbid, it must be distilled according to the Cleanup Procedure as follows:

Analytical Method for Measuring Phenols in water:

1. Dirt is removed from the water sample by suction-filtration through a glass-type filter paper, and 10 mL of NH_4Cl (50g/1000mL) is added to 500-mL filtrate in a separatory funnel.
2. The pH of the solution is adjusted to 10 by adding 5 mL of 25% ammonia solution, and 3 mL of 4-aminoantipyrene (4-amino-2,3-dimethyl-1-phenyl-3-pyrazoline-5-one) (2g/100mL), 3 mL of potassium hexacyanoferate (8g/100mL), $K_3[Fe(CN)_6]$ and 25 mL of chloroform are added sequentially to the separatory funnel.
3. The chloroform layer is separated from the aqueous layer, dried over sodium sulfate and filtered.
4. The chloroform layer is analyzed by a UV spectrometer at 460 nm and compared against a standard curve to find the concentration of phenols.

Analytical Method for Measuring Phenols in sediment:

1. Place 550 mL of water into a 1-L Pyrex distillation flask.
2. Quantitatively transfer a 10 to 50 g aliquot of the sediment sample to be analyzed to the distillation flask.
3. Adjust the pH of the sample to approximately 4 with the addition of 1 N sulfuric acid, and distill over 500 mL of distillate and proceed similar to the procedure for measuring phenols in water.

Appendix L

Materials and Methods

for Other Possible Chemicals Analysis

Materials and Methods for Other Possible Chemicals Analysis

The chemicals used were: methylene chloride (CH_2Cl_2), isopropanol (Aldrich, 99.5%), sodium sulfate (Na_2SO_4, Carlo Erba, 99.8%). The followings were the preparation and instrumental methods for analyzing the water samples.

Preparation Method:

2000 mL of water samples from location A, B, C and D were suction-filtered through a Buchner funnel with a 1.2 □m Glass Microfibre Grade GF/C filter paper (Whatman). The filtrate was extracted with 100 mL of CH_2Cl_2 three times, and 100 mL of isopropanol three times. The filter paper was also extracted with 10 mL of CH_2Cl_2 three times. All organic extracts were combined, dried with sodium sulfate, and evaporated under vacuum for the GC/MS analysis.

Instrumental Method:

The GC/MS analysis was performed with a Shimadzu's GC-17A gas chromatograph and a QP-5000 EI quadruple mass spectrometer, and monitored using a SCAN mode. Chromatographic resolution was achieved with a 60 m long x 0.32 m ID fused silica capillary column coated with SUPELCO's SPB-1 of 0.25 □m film thickness. The temperature program was set up with the initial column temperature of 80^0C, final column temperature of 270^0C, and rate of 5^0C/min. Helium was a carrier gas. The injector temperature was kept at 250°C, and the detector was maintained at 300°C.

Appendix M

1999 Runoff for Each Segment (After Runoff Calibration)

Daily Total RO	%	3.5	9.8	13	13	22	22	13
(MCM)	Date	NS	NJ	NP	KB	CT	ST	KP
0	01/01/99	0						0
0	01/04/99	0						0
0	01/05/99	0						0
4.6	01/06/99	0.16	0.45	0.6	0.6	1	1	0.6
3.2	01/07/99	0.11	0.31	0.42	0.42	0.696	0.7	0.42
0	01/08/99	0	0	0	0	0	0	0
0	01/23/99	0	0	0	0	0	0	0
3.2	01/24/99	0.11	0.31	0.42	0.42	0.696	0.7	0.42
3.4	01/25/99	0.12	0.33	0.44	0.44	0.739	0.74	0.44
6.3	01/26/99	0.22	0.62	0.82	0.82	1.37	1.37	0.82
6.1	01/27/99	0.21	0.6	0.8	0.8	1.326	1.33	0.8
11	01/28/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
10	01/29/99	0.35	0.98	1.3	1.3	2.174	2.17	1.3
11	01/30/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
11	01/31/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
0.7	02/01/99	0.02	0.07	0.09	0.09	0.152	0.15	0.09
0	02/02/99	0	0	0	0	0	0	0
0	02/03/99	0	0	0	0	0	0	0
0	02/04/99	0	0	0	0	0	0	0
0.8	02/05/99	0.03	0.08	0.1	0.1	0.174	0.17	0.1
3.5	02/06/99	0.12	0.34	0.46	0.46	0.761	0.76	0.46
2.9	02/07/99	0.1	0.28	0.38	0.38	0.63	0.63	0.38
2.5	02/08/99	0.09	0.24	0.33	0.33	0.543	0.54	0.33
3	02/09/99	0.11	0.29	0.39	0.39	0.652	0.65	0.39
2.1	02/10/99	0.07	0.21	0.27	0.27	0.457	0.46	0.27
0	02/11/99	0	0	0	0	0	0	0
2.2	02/12/99	0.08	0.22	0.29	0.29	0.478	0.48	0.29
1.5	02/13/99	0.05	0.15	0.2	0.2	0.326	0.33	0.2
1.9	02/14/99	0.07	0.19	0.25	0.25	0.413	0.41	0.25
2.7	02/15/99	0.09	0.26	0.35	0.35	0.587	0.59	0.35
0	02/16/99	0	0	0	0	0	0	0
0	03/04/99	0	0	0	0	0	0	0
5.3	03/05/99	0.19	0.52	0.69	0.69	1.152	1.15	0.69
13	03/06/99	0.46	1.27	1.7	1.7	2.826	2.83	1.7
11	03/07/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
11	03/08/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
0	03/09/99	0	0	0	0	0	0	0
0	03/10/99	0	0	0	0	0	0	0
0	03/11/99	0	0	0	0	0	0	0
0	03/12/99	0	0	0	0	0	0	0
0.2	03/13/99	0.01	0.02	0.03	0.03	0.043	0.04	0.03
0	03/14/99	0	0	0	0	0	0	0
0.5	03/15/99	0.02	0.05	0.07	0.07	0.109	0.11	0.07
0	03/16/99	0	0	0	0	0	0	0

0	03/28/99	0	0	0	0	0	0	0
5	03/29/99	0.18	0.49	0.65	0.65	1.087	1.09	0.65
1.9	03/30/99	0.07	0.19	0.25	0.25	0.413	0.41	0.25
1.6	03/31/99	0.06	0.16	0.21	0.21	0.348	0.35	0.21
1.6	04/01/99	0.06	0.16	0.21	0.21	0.348	0.35	0.21
1.6	04/02/99	0.06	0.16	0.21	0.21	0.348	0.35	0.21
1	04/03/99	0.04	0.1	0.13	0.13	0.217	0.22	0.13
1.9	04/04/99	0.07	0.19	0.25	0.25	0.413	0.41	0.25
0	04/05/99	0	0	0	0	0	0	0
0	04/06/99	0	0	0	0	0	0	0
0.8	04/07/99	0.03	0.08	0.1	0.1	0.174	0.17	0.1
0	04/08/99	0	0	0	0	0	0	0
0	04/17/99	0	0	0	0	0	0	0
2.8	04/18/99	0.1	0.27	0.37	0.37	0.609	0.61	0.37
0	04/19/99	0	0	0	0	0	0	0
0	04/20/99	0	0	0	0	0	0	0
17	04/21/99	0.6	1.66	2.22	2.22	3.696	3.7	2.22
7.4	04/22/99	0.26	0.72	0.97	0.97	1.609	1.61	0.97
6	04/23/99	0.21	0.59	0.78	0.78	1.304	1.3	0.78
3.8	04/24/99	0.13	0.37	0.5	0.5	0.826	0.83	0.5
0.7	04/25/99	0.02	0.07	0.09	0.09	0.152	0.15	0.09
7.9	04/26/99	0.28	0.77	1.03	1.03	1.717	1.72	1.03
6.6	04/27/99	0.23	0.65	0.86	0.86	1.435	1.43	0.86
3.2	04/28/99	0.11	0.31	0.42	0.42	0.696	0.7	0.42
2	04/29/99	0.07	0.2	0.26	0.26	0.435	0.43	0.26
0.2	04/30/99	0.01	0.02	0.03	0.03	0.043	0.04	0.03
1.04	05/01/99	0.04	0.1	0.14	0.14	0.226	0.23	0.14
0	05/02/99	0	0	0	0	0	0	0
0	05/03/99	0	0	0	0	0	0	0
0	05/04/99	0	0	0	0	0	0	0
1.27	05/05/99	0.04	0.12	0.17	0.17	0.276	0.28	0.17
0	05/06/99	0	0	0	0	0	0	0
2.08	05/07/99	0.07	0.2	0.27	0.27	0.452	0.45	0.27
8.33	05/08/99	0.29	0.81	1.09	1.09	1.811	1.81	1.09
24.5	05/09/99	0.86	2.4	3.2	3.2	5.326	5.33	3.2
35.9	05/10/99	1.26	3.51	4.68	4.68	7.804	7.8	4.68
60.9	05/11/99	2.13	5.96	7.94	7.94	13.24	13.2	7.94
52.1	05/12/99	1.82	5.1	6.8	6.8	11.33	11.3	6.8
40	05/13/99	1.4	3.91	5.22	5.22	8.696	8.7	5.22
62.5	05/14/99	2.19	6.11	8.15	8.15	13.59	13.6	8.15
40.7	05/15/99	1.42	3.98	5.31	5.31	8.848	8.85	5.31
27	05/16/99	0.95	2.64	3.52	3.52	5.87	5.87	3.52
18.5	05/17/99	0.65	1.81	2.41	2.41	4.022	4.02	2.41
14.4	05/18/99	0.5	1.41	1.88	1.88	3.13	3.13	1.88
11	05/19/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
8.45	05/20/99	0.3	0.83	1.1	1.1	1.837	1.84	1.1
9.72	05/21/99	0.34	0.95	1.27	1.27	2.113	2.11	1.27
12	05/22/99	0.42	1.17	1.57	1.57	2.609	2.61	1.57

14	05/23/99	0.49	1.37	1.83	1.83	3.043	3.04	1.83
20	05/24/99	0.7	1.96	2.61	2.61	4.348	4.35	2.61
22	05/25/99	0.77	2.15	2.87	2.87	4.783	4.78	2.87
18.4	05/26/99	0.64	1.8	2.4	2.4	4	4	2.4
13.3	05/27/99	0.47	1.3	1.73	1.73	2.891	2.89	1.73
12	05/28/99	0.42	1.17	1.57	1.57	2.609	2.61	1.57
11.2	05/29/99	0.39	1.1	1.46	1.46	2.435	2.43	1.46
8.9	05/30/99	0.31	0.87	1.16	1.16	1.935	1.93	1.16
9.26	05/31/99	0.32	0.91	1.21	1.21	2.013	2.01	1.21
7.75	06/01/99	0.27	0.76	1.01	1.01	1.685	1.68	1.01
8.56	06/02/99	0.3	0.84	1.12	1.12	1.861	1.86	1.12
0	06/03/99	0	0	0	0	0	0	0
5.9	06/04/99	0.21	0.58	0.77	0.77	1.283	1.28	0.77
10.2	06/05/99	0.36	1	1.33	1.33	2.217	2.22	1.33
9.3	06/06/99	0.33	0.91	1.21	1.21	2.022	2.02	1.21
10.5	06/07/99	0.37	1.03	1.37	1.37	2.283	2.28	1.37
9	06/08/99	0.32	0.88	1.17	1.17	1.957	1.96	1.17
6.8	06/09/99	0.24	0.67	0.89	0.89	1.478	1.48	0.89
9	06/10/99	0.32	0.88	1.17	1.17	1.957	1.96	1.17
9	06/11/99	0.32	0.88	1.17	1.17	1.957	1.96	1.17
11	06/12/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
11	06/13/99	0.39	1.08	1.43	1.43	2.391	2.39	1.43
12	06/14/99	0.42	1.17	1.57	1.57	2.609	2.61	1.57
14.5	06/15/99	0.51	1.42	1.89	1.89	3.152	3.15	1.89
5	06/16/99	0.18	0.49	0.65	0.65	1.087	1.09	0.65
5	06/17/99	0.18	0.49	0.65	0.65	1.087	1.09	0.65
0	06/18/99	0	0	0	0	0	0	0
0	07/02/99	0	0	0	0	0	0	0
7.64	07/03/99	0.27	0.75	1	1	1.661	1.66	1
0	07/04/99	0	0	0	0	0	0	0
7.99	07/05/99	0.28	0.78	1.04	1.04	1.737	1.74	1.04
0	07/06/99	0	0	0	0	0	0	0
12.7	07/07/99	0.44	1.24	1.66	1.66	2.761	2.76	1.66
26.2	07/08/99	0.92	2.56	3.42	3.42	5.696	5.7	3.42
48	07/09/99	1.68	4.7	6.26	6.26	10.43	10.4	6.26
0	07/10/99	0	0	0	0	0	0	0
52.9	07/11/99	1.85	5.18	6.9	6.9	11.5	11.5	6.9
0	07/12/99	0	0	0	0	0	0	0
67.7	07/13/99	2.37	6.62	8.83	8.83	14.72	14.7	8.83
0	07/14/99	0	0	0	0	0	0	0
0	07/15/99	0	0	0	0	0	0	0
20.5	07/16/99	0.72	2.01	2.67	2.67	4.457	4.46	2.67
3.94	07/17/99	0.14	0.39	0.51	0.51	0.857	0.86	0.51
5.8	07/18/99	0.2	0.57	0.76	0.76	1.261	1.26	0.76
101	07/19/99	3.54	9.88	13.2	13.2	21.96	22	13.2
0	07/20/99	0	0	0	0	0	0	0
0	08/02/99	0	0	0	0	0	0	0
23	08/03/99	0.81	2.25	3	3	5	5	3

0	08/04/99	0	0	0	0	0	0	0
0	08/05/99	0	0	0	0	0	0	0
28.4	08/06/99	0.99	2.78	3.7	3.7	6.174	6.17	3.7
46.2	08/07/99	1.62	4.52	6.03	6.03	10.04	10	6.03
0	08/08/99	0	0	0	0	0	0	0
0	08/09/99	0	0	0	0	0	0	0
0	08/10/99	0	0	0	0	0	0	0
26.7	08/11/99	0.93	2.61	3.48	3.48	5.804	5.8	3.48
23.5	08/12/99	0.82	2.3	3.07	3.07	5.109	5.11	3.07
21.6	08/13/99	0.76	2.11	2.82	2.82	4.696	4.7	2.82
26.5	08/14/99	0.93	2.59	3.46	3.46	5.761	5.76	3.46
23	08/15/99	0.81	2.25	3	3	5	5	3
0	08/16/99	0	0	0	0	0	0	0
36	08/17/99	1.26	3.52	4.7	4.7	7.826	7.83	4.7
31	08/18/99	1.09	3.03	4.04	4.04	6.739	6.74	4.04
34.1	08/19/99	1.19	3.34	4.45	4.45	7.413	7.41	4.45
17.1	08/20/99	0.6	1.67	2.23	2.23	3.717	3.72	2.23
16	08/21/99	0.56	1.57	2.09	2.09	3.478	3.48	2.09
16.3	08/22/99	0.57	1.59	2.13	2.13	3.543	3.54	2.13
0	08/23/99	0	0	0	0	0	0	0
0	08/24/99	0	0	0	0	0	0	0
15.5	08/25/99	0.54	1.52	2.02	2.02	3.37	3.37	2.02
5.32	08/26/99	0.19	0.52	0.69	0.69	1.157	1.16	0.69

Appendix N

2000 Runoff for Each Segment (After Runoff Calibration)

Total Daily RO	%	3.5	9.78	13.04	13.04	21.74	10	21.7	13.04
	Date	NS	KNJ	NP	KB	CT	BelowCT	ST	KP
	1/1/00	0	0	0	0	0	0	0	0
	1/2/00	0	0	0	0	0	0	0	0
	1/3/00	0	0	0	0	0	0	0	0
	1/4/00	0	0	0	0	0	0	0	0
	1/5/00	0	0	0	0	0	0	0	0
1.5	1/6/00	0.053	0.1467	0.196	0.196	0.326	0.225	0.326	0.196
0.46	1/7/00	0.016	0.045	0.06	0.06	0.1	0.069	0.1	0.06
0.23	1/8/00	0.008	0.0225	0.03	0.03	0.05	0.035	0.05	0.03
0.35	1/9/00	0.012	0.0342	0.046	0.046	0.076	0.053	0.076	0.046
	1/10/00	0	0	0	0	0	0	0	0
0.69	1/11/00	0.024	0.0675	0.09	0.09	0.15	0.104	0.15	0.09
0.3	1/12/00	0.011	0.0293	0.039	0.039	0.065	0.045	0.065	0.039
	1/13/00	0	0	0	0	0	0	0	0
	1/14/00	0	0	0	0	0	0	0	0
	1/15/00	0	0	0	0	0	0	0	0
	1/16/00	0	0	0	0	0	0	0	0
	1/17/00	0	0	0	0	0	0	0	0
	1/18/00	0	0	0	0	0	0	0	0
0.12	1/19/00	0.004	0.0117	0.016	0.016	0.026	0.018	0.026	0.016
0.69	1/20/00	0.024	0.0675	0.09	0.09	0.15	0.104	0.15	0.09
	1/21/00	0	0	0	0	0	0	0	0
	1/22/00	0	0	0	0	0	0	0	0
	1/23/00	0	0	0	0	0	0	0	0
	1/24/00	0	0	0	0	0	0	0	0
	1/25/00	0	0	0	0	0	0	0	0
	1/26/00	0	0	0	0	0	0	0	0
	1/27/00	0	0	0	0	0	0	0	0
	1/28/00	0	0	0	0	0	0	0	0
	1/29/00	0	0	0	0	0	0	0	0
	1/30/00	0	0	0	0	0	0	0	0
0.69	1/31/00	0.024	0.0675	0.09	0.09	0.15	0.104	0.15	0.09
0.69	2/1/00	0.024	0.0675	0.09	0.09	0.15	0.104	0.15	0.09
0.81	2/2/00	0.028	0.0792	0.106	0.106	0.176	0.122	0.176	0.106
	2/3/00	0	0	0	0	0	0	0	0
	2/4/00	0	0	0	0	0	0	0	0
	2/5/00	0	0	0	0	0	0	0	0
	2/6/00	0	0	0	0	0	0	0	0
	2/7/00	0	0	0	0	0	0	0	0
	2/8/00	0	0	0	0	0	0	0	0
	2/9/00	0	0	0	0	0	0	0	0
	2/10/00	0	0	0	0	0	0	0	0
0.69	2/11/00	0.024	0.0675	0.09	0.09	0.15	0.104	0.15	0.09
	2/12/00	0	0	0	0	0	0	0	0
	2/13/00	0	0	0	0	0	0	0	0

	2/14/00	0	0	0	0	0	0	0	0
2.55	2/15/00	0.089	0.2494	0.333	0.333	0.554	0.383	0.554	0.333
7.18	2/16/00	0.251	0.7022	0.936	0.936	1.561	1.077	1.561	0.936
7.18	2/17/00	0.251	0.7022	0.936	0.936	1.561	1.077	1.561	0.936
10.5	2/18/00	0.368	1.0269	1.369	1.369	2.283	1.575	2.283	1.369
0.23	2/19/00	0.008	0.0225	0.03	0.03	0.05	0.035	0.05	0.03
11.2	2/20/00	0.392	1.0954	1.46	1.46	2.435	1.68	2.435	1.46
2.31	2/21/00	0.081	0.2259	0.301	0.301	0.502	0.347	0.502	0.301
	2/22/00	0	0	0	0	0	0	0	0
5.67	2/23/00	0.198	0.5545	0.739	0.739	1.233	0.851	1.233	0.739
0.12	2/24/00	0.004	0.0117	0.016	0.016	0.026	0.018	0.026	0.016
	2/25/00	0	0	0	0	0	0	0	0
	2/26/00	0	0	0	0	0	0	0	0
	2/27/00	0	0	0	0	0	0	0	0
	2/28/00	0	0	0	0	0	0	0	0
	2/29/00	0	0	0	0	0	0	0	0
	3/1/00	0	0	0	0	0	0	0	0
	3/2/00	0	0	0	0	0	0	0	0
	3/3/00	0	0	0	0	0	0	0	0
	3/4/00	0	0	0	0	0	0	0	0
	3/5/00	0	0	0	0	0	0	0	0
	3/6/00	0	0	0	0	0	0	0	0
0.23	3/7/00	0.008	0.0225	0.03	0.03	0.05	0.035	0.05	0.03
	3/8/00	0	0	0	0	0	0	0	0
	3/9/00	0	0	0	0	0	0	0	0
	3/10/00	0	0	0	0	0	0	0	0
1.39	3/11/00	0.049	0.1359	0.181	0.181	0.302	0.209	0.302	0.181
5.79	3/12/00	0.203	0.5663	0.755	0.755	1.259	0.869	1.259	0.755
1.5	3/13/00	0.053	0.1467	0.196	0.196	0.326	0.225	0.326	0.196
2.2	3/14/00	0.077	0.2152	0.287	0.287	0.478	0.33	0.478	0.287
2.08	3/15/00	0.073	0.2034	0.271	0.271	0.452	0.312	0.452	0.271
3.94	3/16/00	0.138	0.3853	0.514	0.514	0.857	0.591	0.857	0.514
3.82	3/17/00	0.134	0.3736	0.498	0.498	0.83	0.573	0.83	0.498
7.41	3/18/00	0.259	0.7247	0.966	0.966	1.611	1.112	1.611	0.966
4.17	3/19/00	0.146	0.4078	0.544	0.544	0.907	0.626	0.907	0.544
2.55	3/20/00	0.089	0.2494	0.333	0.333	0.554	0.383	0.554	0.333
5.56	3/21/00	0.195	0.5438	0.725	0.725	1.209	0.834	1.209	0.725
3.24	3/22/00	0.113	0.3169	0.422	0.422	0.704	0.486	0.704	0.422
0.46	3/23/00	0.016	0.045	0.06	0.06	0.1	0.069	0.1	0.06
3.24	3/24/00	0.113	0.3169	0.422	0.422	0.704	0.486	0.704	0.422
2.43	3/25/00	0.085	0.2377	0.317	0.317	0.528	0.365	0.528	0.317
6.71	3/26/00	0.235	0.6562	0.875	0.875	1.459	1.007	1.459	0.875
3.82	3/27/00	0.134	0.3736	0.498	0.498	0.83	0.573	0.83	0.498
4.17	3/28/00	0.146	0.4078	0.544	0.544	0.907	0.626	0.907	0.544
6.83	3/29/00	0.239	0.668	0.891	0.891	1.485	1.025	1.485	0.891
6.83	3/30/00	0.239	0.668	0.891	0.891	1.485	1.025	1.485	0.891
12.6	3/31/00	0.441	1.2323	1.643	1.643	2.739	1.89	2.739	1.643
7.52	4/1/00	0.263	0.7355	0.981	0.981	1.635	1.128	1.635	0.981

7.64	4/2/00	0.267	0.7472	0.996	0.996	1.661	1.146	1.661	0.996
8.1	4/3/00	0.284	0.7922	1.056	1.056	1.761	1.215	1.761	1.056
6.71	4/4/00	0.235	0.6562	0.875	0.875	1.459	1.007	1.459	0.875
9.95	4/5/00	0.348	0.9731	1.297	1.297	2.163	1.493	2.163	1.297
10.4	4/6/00	0.364	1.0171	1.356	1.356	2.261	1.56	2.261	1.356
10.5	4/7/00	0.368	1.0269	1.369	1.369	2.283	1.575	2.283	1.369
10.1	4/8/00	0.354	0.9878	1.317	1.317	2.196	1.515	2.196	1.317
10.6	4/9/00	0.371	1.0367	1.382	1.382	2.304	1.59	2.304	1.382
12.8	4/10/00	0.448	1.2518	1.669	1.669	2.783	1.92	2.783	1.669
27.4	4/11/00	0.959	2.6797	3.573	3.573	5.957	4.11	5.957	3.573
17.1	4/12/00	0.599	1.6724	2.23	2.23	3.718	2.565	3.718	2.23
14.7	4/13/00	0.515	1.4377	1.917	1.917	3.196	2.205	3.196	1.917
8.56	4/14/00	0.3	0.8372	1.116	1.116	1.861	1.284	1.861	1.116
13.7	4/15/00	0.48	1.3399	1.786	1.786	2.978	2.055	2.978	1.786
13.5	4/16/00	0.473	1.3203	1.76	1.76	2.935	2.025	2.935	1.76
	4/17/00	0	0	0	0	0	0	0	0
	4/18/00	0	0	0	0	0	0	0	0
5.67	4/19/00	0.198	0.5545	0.739	0.739	1.233	0.851	1.233	0.739
16	4/20/00	0.56	1.5648	2.086	2.086	3.478	2.4	3.478	2.086
19.2	4/21/00	0.672	1.8778	2.504	2.504	4.174	2.88	4.174	2.504
14.2	4/22/00	0.497	1.3888	1.852	1.852	3.087	2.13	3.087	1.852
7.64	4/23/00	0.267	0.7472	0.996	0.996	1.661	1.146	1.661	0.996
7.75	4/24/00	0.271	0.758	1.011	1.011	1.685	1.163	1.685	1.011
9.72	4/25/00	0.34	0.9506	1.267	1.267	2.113	1.458	2.113	1.267
15	4/26/00	0.525	1.467	1.956	1.956	3.261	2.25	3.261	1.956
28.6	4/27/00	1.001	2.7971	3.729	3.729	6.218	4.29	6.218	3.729
28	4/28/00	0.98	2.7384	3.651	3.651	6.087	4.2	6.087	3.651
52.5	4/29/00	1.838	5.1345	6.846	6.846	11.41	7.875	11.41	6.846
40	4/30/00	1.4	3.912	5.216	5.216	8.696	6	8.696	5.216
	5/1/00	0	0	0	0	0	0	0	0
	5/2/00	0	0	0	0	0	0	0	0
39	5/3/00	1.365	3.8142	5.086	5.086	8.479	5.85	8.479	5.086
19.3	5/4/00	0.676	1.8875	2.517	2.517	4.196	2.895	4.196	2.517
12.7	5/5/00	0.445	1.2421	1.656	1.656	2.761	1.905	2.761	1.656
13.9	5/6/00	0.487	1.3594	1.813	1.813	3.022	2.085	3.022	1.813
14.8	5/7/00	0.518	1.4474	1.93	1.93	3.218	2.22	3.218	1.93
8.56	5/8/00	0.3	0.8372	1.116	1.116	1.861	1.284	1.861	1.116
14.8	5/9/00	0.518	1.4474	1.93	1.93	3.218	2.22	3.218	1.93
8.91	5/10/00	0.312	0.8714	1.162	1.162	1.937	1.337	1.937	1.162
41.7	5/11/00	1.46	4.0783	5.438	5.438	9.066	6.255	9.066	5.438
3.36	5/12/00	0.118	0.3286	0.438	0.438	0.73	0.504	0.73	0.438
16.7	5/13/00	0.585	1.6333	2.178	2.178	3.631	2.505	3.631	2.178
10.6	5/14/00	0.371	1.0367	1.382	1.382	2.304	1.59	2.304	1.382
10.3	5/15/00	0.361	1.0073	1.343	1.343	2.239	1.545	2.239	1.343
12.3	5/16/00	0.431	1.2029	1.604	1.604	2.674	1.845	2.674	1.604
17.7	5/17/00	0.62	1.7311	2.308	2.308	3.848	2.655	3.848	2.308
16	5/18/00	0.56	1.5648	2.086	2.086	3.478	2.4	3.478	2.086
6.83	5/19/00	0.239	0.668	0.891	0.891	1.485	1.025	1.485	0.891

16	5/20/00	0.56	1.5648	2.086	2.086	3.478	2.4	3.478	2.086
11.5	5/21/00	0.403	1.1247	1.5	1.5	2.5	1.725	2.5	1.5
18.2	5/22/00	0.637	1.78	2.373	2.373	3.957	2.73	3.957	2.373
	5/23/00	0	0	0	0	0	0	0	0
1.27	5/24/00	0.044	0.1242	0.166	0.166	0.276	0.191	0.276	0.166
1.85	5/25/00	0.065	0.1809	0.241	0.241	0.402	0.278	0.402	0.241
43.1	5/26/00	1.509	4.2152	5.62	5.62	9.37	6.465	9.37	5.62
49.3	5/27/00	1.726	4.8215	6.429	6.429	10.72	7.395	10.72	6.429
52.9	5/28/00	1.852	5.1736	6.898	6.898	11.5	7.935	11.5	6.898
16.4	5/29/00	0.574	1.6039	2.139	2.139	3.565	2.46	3.565	2.139
9.49	5/30/00	0.332	0.9281	1.237	1.237	2.063	1.424	2.063	1.237
22.2	5/31/00	0.777	2.1712	2.895	2.895	4.826	3.33	4.826	2.895
20.4	6/1/00	0.714	1.9951	2.66	2.66	4.435	3.06	4.435	2.66
21.9	6/2/00	0.767	2.1418	2.856	2.856	4.761	3.285	4.761	2.856
0	6/3/00	0	0	0	0	0	0	0	0
0	6/4/00	0	0	0	0	0	0	0	0
0	6/5/00	0	0	0	0	0	0	0	0
0	6/6/00	0	0	0	0	0	0	0	0
4.86	6/7/00	0.17	0.4753	0.634	0.634	1.057	0.729	1.057	0.634
0	6/8/00	0	0	0	0	0	0	0	0
22.6	6/9/00	0.791	2.2103	2.947	2.947	4.913	3.39	4.913	2.947
3.59	6/10/00	0.126	0.3511	0.468	0.468	0.78	0.539	0.78	0.468
9.03	6/11/00	0.316	0.8831	1.178	1.178	1.963	1.355	1.963	1.178
7.99	6/12/00	0.28	0.7814	1.042	1.042	1.737	1.199	1.737	1.042
4.98	6/13/00	0.174	0.487	0.649	0.649	1.083	0.747	1.083	0.649
	6/14/00	0	0	0	0	0	0	0	0
0.58	6/15/00	0.02	0.0567	0.076	0.076	0.126	0.087	0.126	0.076
2.43	6/16/00	0.085	0.2377	0.317	0.317	0.528	0.365	0.528	0.317
6.02	6/17/00	0.211	0.5888	0.785	0.785	1.309	0.903	1.309	0.785
5.9	6/18/00	0.207	0.577	0.769	0.769	1.283	0.885	1.283	0.769
8.56	6/19/00	0.3	0.8372	1.116	1.116	1.861	1.284	1.861	1.116
31.8	6/20/00	1.113	3.11	4.147	4.147	6.913	4.77	6.913	4.147
39.4	6/21/00	1.379	3.8533	5.138	5.138	8.566	5.91	8.566	5.138
10.9	6/22/00	0.382	1.066	1.421	1.421	2.37	1.635	2.37	1.421
7.99	6/23/00	0.28	0.7814	1.042	1.042	1.737	1.199	1.737	1.042
10.3	6/24/00	0.361	1.0073	1.343	1.343	2.239	1.545	2.239	1.343
12.8	6/25/00	0.448	1.2518	1.669	1.669	2.783	1.92	2.783	1.669
16.7	6/26/00	0.585	1.6333	2.178	2.178	3.631	2.505	3.631	2.178
22.6	6/27/00	0.791	2.2103	2.947	2.947	4.913	3.39	4.913	2.947
25.3	6/28/00	0.886	2.4743	3.299	3.299	5.5	3.795	5.5	3.299
7.52	6/29/00	0.263	0.7355	0.981	0.981	1.635	1.128	1.635	0.981
6.02	6/30/00	0.211	0.5888	0.785	0.785	1.309	0.903	1.309	0.785
4.63	7/1/00	0.162	0.4528	0.604	0.604	1.007	0.695	1.007	0.604
11.6	7/2/00	0.406	1.1345	1.513	1.513	2.522	1.74	2.522	1.513
13.3	7/3/00	0.466	1.3007	1.734	1.734	2.891	1.995	2.891	1.734
8.45	7/4/00	0.296	0.8264	1.102	1.102	1.837	1.268	1.837	1.102
0	7/5/00	0	0	0	0	0	0	0	0
0	7/6/00	0	0	0	0	0	0	0	0

0	7/7/00	0	0	0	0	0	0	0	0
0	7/8/00	0	0	0	0	0	0	0	0
6.02	7/9/00	0.211	0.5888	0.785	0.785	1.309	0.903	1.309	0.785
2.31	7/10/00	0.081	0.2259	0.301	0.301	0.502	0.347	0.502	0.301
21.6	7/11/00	0.756	2.1125	2.817	2.817	4.696	3.24	4.696	2.817
29.2	7/12/00	1.022	2.8558	3.808	3.808	6.348	4.38	6.348	3.808
40.6	7/13/00	1.421	3.9707	5.294	5.294	8.826	6.09	8.826	5.294
61.9	7/14/00	2.167	6.0538	8.072	8.072	13.46	9.285	13.46	8.072
65.2	7/15/00	2.282	6.3766	8.502	8.502	14.17	9.78	14.17	8.502
43.3	7/16/00	1.516	4.2347	5.646	5.646	9.413	6.495	9.413	5.646
26.3	7/17/00	0.921	2.5721	3.43	3.43	5.718	3.945	5.718	3.43
20	7/18/00	0.7	1.956	2.608	2.608	4.348	3	4.348	2.608
4.17	7/19/00	0.146	0.4078	0.544	0.544	0.907	0.626	0.907	0.544
83	7/20/00	2.905	8.1174	10.82	10.82	18.04	12.45	18.04	10.82
70.4	7/21/00	2.464	6.8851	9.18	9.18	15.3	10.56	15.3	9.18
43.2	7/22/00	1.512	4.225	5.633	5.633	9.392	6.48	9.392	5.633
29.6	7/23/00	1.036	2.8949	3.86	3.86	6.435	4.44	6.435	3.86
24.4	7/24/00	0.854	2.3863	3.182	3.182	5.305	3.66	5.305	3.182
33.6	7/25/00	1.176	3.2861	4.381	4.381	7.305	5.04	7.305	4.381
37	7/26/00	1.295	3.6186	4.825	4.825	8.044	5.55	8.044	4.825
35	7/27/00	1.225	3.423	4.564	4.564	7.609	5.25	7.609	4.564
33.8	7/28/00	1.183	3.3056	4.408	4.408	7.348	5.07	7.348	4.408
27	7/29/00	0.945	2.6406	3.521	3.521	5.87	4.05	5.87	3.521
33.3	7/30/00	1.166	3.2567	4.342	4.342	7.239	4.995	7.239	4.342
33.4	7/31/00	1.169	3.2665	4.355	4.355	7.261	5.01	7.261	4.355
33	8/1/00	1.155	3.2274	4.303	4.303	7.174	4.95	7.174	4.303
31.6	8/2/00	1.106	3.0905	4.121	4.121	6.87	4.74	6.87	4.121
31.7	8/3/00	1.11	3.1003	4.134	4.134	6.892	4.755	6.892	4.134
30.9	8/4/00	1.082	3.022	4.029	4.029	6.718	4.635	6.718	4.029
30.7	8/5/00	1.075	3.0025	4.003	4.003	6.674	4.605	6.674	4.003
27.9	8/6/00	0.977	2.7286	3.638	3.638	6.065	4.185	6.065	3.638
34.5	8/7/00	1.208	3.3741	4.499	4.499	7.5	5.175	7.5	4.499
41.6	8/8/00	1.456	4.0685	5.425	5.425	9.044	6.24	9.044	5.425
44.6	8/9/00	1.561	4.3619	5.816	5.816	9.696	6.69	9.696	5.816
67.7	8/10/00	2.37	6.6211	8.828	8.828	14.72	10.16	14.72	8.828
14.9	8/11/00	0.522	1.4572	1.943	1.943	3.239	2.235	3.239	1.943
86.9	8/12/00	3.042	8.4988	11.33	11.33	18.89	13.04	18.89	11.33
76.3	8/13/00	2.671	7.4621	9.95	9.95	16.59	11.45	16.59	9.95
60.8	8/14/00	2.128	5.9462	7.928	7.928	13.22	9.12	13.22	7.928
46.2	8/15/00	1.617	4.5184	6.024	6.024	10.04	6.93	10.04	6.024
44.2	8/16/00	1.547	4.3228	5.764	5.764	9.609	6.63	9.609	5.764
27.9	8/17/00	0.977	2.7286	3.638	3.638	6.065	4.185	6.065	3.638
30.3	8/18/00	1.061	2.9633	3.951	3.951	6.587	4.545	6.587	3.951
20.6	8/19/00	0.721	2.0147	2.686	2.686	4.478	3.09	4.478	2.686
20.1	8/20/00	0.704	1.9658	2.621	2.621	4.37	3.015	4.37	2.621
22.5	8/21/00	0.788	2.2005	2.934	2.934	4.892	3.375	4.892	2.934
16.2	8/22/00	0.567	1.5844	2.112	2.112	3.522	2.43	3.522	2.112
27.9	8/23/00	0.977	2.7286	3.638	3.638	6.065	4.185	6.065	3.638

25	8/24/00	0.875	2.445	3.26	3.26	5.435	3.75	5.435	3.26
27.4	8/25/00	0.959	2.6797	3.573	3.573	5.957	4.11	5.957	3.573
19	8/26/00	0.665	1.8582	2.478	2.478	4.131	2.85	4.131	2.478
19.2	8/27/00	0.672	1.8778	2.504	2.504	4.174	2.88	4.174	2.504
21.9	8/28/00	0.767	2.1418	2.856	2.856	4.761	3.285	4.761	2.856
17.6	8/29/00	0.616	1.7213	2.295	2.295	3.826	2.64	3.826	2.295
16.2	8/30/00	0.567	1.5844	2.112	2.112	3.522	2.43	3.522	2.112
16.4	8/31/00	0.574	1.6039	2.139	2.139	3.565	2.46	3.565	2.139
15.3	9/1/00	0.536	1.4963	1.995	1.995	3.326	2.295	3.326	1.995
15.2	9/2/00	0.532	1.4866	1.982	1.982	3.304	2.28	3.304	1.982
14	9/3/00	0.49	1.3692	1.826	1.826	3.044	2.1	3.044	1.826
14.1	9/4/00	0.494	1.379	1.839	1.839	3.065	2.115	3.065	1.839
23.4	9/5/00	0.819	2.2885	3.051	3.051	5.087	3.51	5.087	3.051
17.4	9/6/00	0.609	1.7017	2.269	2.269	3.783	2.61	3.783	2.269
12.4	9/7/00	0.434	1.2127	1.617	1.617	2.696	1.86	2.696	1.617
13.9	9/8/00	0.487	1.3594	1.813	1.813	3.022	2.085	3.022	1.813
12.7	9/9/00	0.445	1.2421	1.656	1.656	2.761	1.905	2.761	1.656
12.8	9/10/00	0.448	1.2518	1.669	1.669	2.783	1.92	2.783	1.669
23.3	9/11/00	0.816	2.2787	3.038	3.038	5.065	3.495	5.065	3.038
36.6	9/12/00	1.281	3.5795	4.773	4.773	7.957	5.49	7.957	4.773
45.4	9/13/00	1.589	4.4401	5.92	5.92	9.87	6.81	9.87	5.92
47.2	9/14/00	1.652	4.6162	6.155	6.155	10.26	7.08	10.26	6.155
44	9/15/00	1.54	4.3032	5.738	5.738	9.566	6.6	9.566	5.738
53	9/16/00	1.855	5.1834	6.911	6.911	11.52	7.95	11.52	6.911
102	9/17/00	3.57	9.9756	13.3	13.3	22.17	15.3	22.17	13.3
	9/18/00	0	0	0	0	0	0	0	0
14.5	9/19/00	0.508	1.4181	1.891	1.891	3.152	2.175	3.152	1.891
8.56	9/20/00	0.3	0.8372	1.116	1.116	1.861	1.284	1.861	1.116
9.95	9/21/00	0.348	0.9731	1.297	1.297	2.163	1.493	2.163	1.297
0	9/22/00	0	0	0	0	0	0	0	0
0	9/23/00	0	0	0	0	0	0	0	0
0	9/24/00	0	0	0	0	0	0	0	0
0	9/25/00	0	0	0	0	0	0	0	0
0	9/26/00	0	0	0	0	0	0	0	0
0	9/27/00	0	0	0	0	0	0	0	0
0	9/28/00	0	0	0	0	0	0	0	0
0	9/29/00	0	0	0	0	0	0	0	0
0	9/30/00	0	0	0	0	0	0	0	0
8.2	10/1/00	0.287	0.802	1.069	1.069	1.783	1.23	1.783	1.069
0	10/2/00	0	0	0	0	0	0	0	0
0	10/3/00	0	0	0	0	0	0	0	0
0.8	10/4/00	0.028	0.0782	0.104	0.104	0.174	0.12	0.174	0.104
0	10/5/00	0	0	0	0	0	0	0	0
0	10/6/00	0	0	0	0	0	0	0	0
18	10/7/00	0.63	1.7604	2.347	2.347	3.913	2.7	3.913	2.347
0	10/8/00	0	0	0	0	0	0	0	0
0	10/9/00	0	0	0	0	0	0	0	0
0	10/10/00	0	0	0	0	0	0	0	0

0	10/11/00	0	0	0	0	0	0	0	0
0	10/12/00	0	0	0	0	0	0	0	0
3.8	10/13/00	0.133	0.3716	0.496	0.496	0.826	0.57	0.826	0.496
0	10/14/00	0	0	0	0	0	0	0	0
0	10/15/00	0	0	0	0	0	0	0	0
0	10/16/00	0	0	0	0	0	0	0	0
0	10/17/00	0	0	0	0	0	0	0	0
0	10/18/00	0	0	0	0	0	0	0	0
0	10/19/00	0	0	0	0	0	0	0	0
3	10/20/00	0.105	0.2934	0.391	0.391	0.652	0.45	0.652	0.391
6.1	10/21/00	0.214	0.5966	0.795	0.795	1.326	0.915	1.326	0.795
5.3	10/22/00	0.186	0.5183	0.691	0.691	1.152	0.795	1.152	0.691
29	10/23/00	1.015	2.8362	3.782	3.782	6.305	4.35	6.305	3.782
18	10/24/00	0.63	1.7604	2.347	2.347	3.913	2.7	3.913	2.347
13	10/25/00	0.455	1.2714	1.695	1.695	2.826	1.95	2.826	1.695
11	10/26/00	0.385	1.0758	1.434	1.434	2.391	1.65	2.391	1.434
24	10/27/00	0.84	2.3472	3.13	3.13	5.218	3.6	5.218	3.13
19	10/28/00	0.665	1.8582	2.478	2.478	4.131	2.85	4.131	2.478
15	10/29/00	0.525	1.467	1.956	1.956	3.261	2.25	3.261	1.956

Biography

Mr. Chanchai Sangsurasak obtained his B.S. degree in chemistry from the University of California at Los Angeles (UCLA) in 1989, and M.S. degree in organic chemistry from the University of Colorado at Boulder (CUB) in 1992. Upon graduating from CUB, he was appointed as an honorarium instructor for teaching organic chemistry at the University of Colorado at Denver.