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Appendix M
Wastewater Treatment Results and Calculations

Table M1
Pilot - Scale Activated Carbon Treatment Analytical Results

September 14, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	29	5.21	NA	NA	NA	NA	NA	NA	21	ND: <5.0
Clarifier Effluent	SP2	20	5.08	NA	NA	NA	NA	NA	NA	16	ND: <5.0
Vortisand Filter Influent	SP3	35	1.14	NA	NA	NA	NA	NA	NA	8.4	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	36	1.11	NA	NA	NA	NA	NA	NA	17	ND: <5.0
GAC Midpoint	SP6A	25	ND: <0.05	NA	NA	NA	NA	NA	NA	11	ND: <5.0
GAC Effluent	SP7	11	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7 Dup	22	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 15, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	42	6.3	NA	NA	NA	NA	NA	NA	18	ND: <5.0
Clarifier Effluent	SP2	71	5.21	NA	NA	NA	NA	NA	NA	6.4	ND: <5.0
Vortisand Filter Influent	SP3	30	1.12	NA	NA	NA	NA	NA	NA	8.5	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	25	1.14	NA	NA	NA	NA	NA	NA	12	7.4
GAC Midpoint	SP6A	46	ND: <0.05	NA	NA	NA	NA	NA	NA	3.4	ND: <5.0
GAC Effluent	SP7	58	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 16, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	69	3.93	NA	NA	19	ND: <5.0	NA	NA	14	ND: <5.0
Clarifier Effluent	SP2	71	3.05	NA	NA	7.4	ND: <5.0	NA	NA	6.2	ND: <5.0
Vortisand Filter Influent	SP3	57	1.29	NA	NA	7.5	ND: <5.0	NA	NA	7.2	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	49	1.28	NA	NA	12	ND: <5.0	NA	NA	12	ND: <5.0
GAC Midpoint	SP6A	39	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	92
GAC Effluent	SP7	34	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M1 (Cont.)
Pilot - Scale Activated Carbon Treatment Analytical Results

September 17, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	74	4.22	NA	NA	14	ND: <5.0	NA	NA	17	ND: <5.0
Clarifier Effluent	SP2	71	3.53	NA	NA	12	ND: <5.0	NA	NA	13	ND: <5.0
Vortisand Filter Influent	SP3	44	1.04	NA	NA	11	ND: <5.0	NA	NA	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	32	1.06	NA	NA	15	ND: <5.0	NA	NA	15	ND: <5.0
GAC Midpoint	SP6A	52	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7	27	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0

September 18, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	76	3.68	NA	NA	NA	NA	NA	NA	16	ND: <5.0
Clarifier Effluent	SP2	89	2.57	NA	NA	NA	NA	NA	NA	12	ND: <5.0
Vortisand Filter Influent	SP3	72	0.98	NA	NA	NA	NA	NA	NA	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	55	1.05	NA	NA	NA	NA	NA	NA	15	ND: <5.0
GAC Midpoint	SP6A	53	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7	52	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 19, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	79	8.27	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	18	ND: <5.0
Clarifier Effluent	SP2	72	3.25	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	7.9	ND: <5.0
Vortisand Filter Influent	SP3	58	1.11	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	45	0.73	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	18	ND: <5.0
GAC Midpoint	SP6A	44	ND: <0.05	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	34	ND: <0.05	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M2
Pilot - Scale UV/OX Treatment Analytical Results

September 25, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	89	11.2	ND: <5.0	ND: <20.0	5.6	ND: <5.0	ND: <5.0	ND: <22.0	22	6.6
Clarifier Effluent	SP2	74	10.8	ND: <5.0	ND: <20.0	4.1	ND: <5.0	ND: <5.0	ND: <22.0	5.0	ND: <5.0
Vortisand Filter Influent	SP3	67	1.26	ND: <5.0	ND: <20.0	7.2	ND: <5.0	ND: <5.0	ND: <22.0	6.9	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	61	ND: <0.05	ND: <5.0	ND: <20.0	9	ND: <5.0	ND: <5.0	ND: <22.0	11	ND: <5.0
UV/Oxidation Effluent	SP5	57	0.06	ND: <5.0	ND: <20.0	14	ND: <5.0	ND: <5.0	ND: <22.0	14	ND: <5.0
GAC Midpoint	SP6A	57	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	3.3	17
GAC Effluent	SP7	62	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
Blank		-	-	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	< 3	ND: <5.0

September 26, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	86	8.72	ND: <5.0	ND: <20.0	7.8	ND: <5.0	ND: <5.0	ND: <22.0	22	6.9
Clarifier Effluent	SP2	81	8.18	ND: <5.0	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	7.2	ND: <5.0
Vortisand Filter Influent	SP3	56	1.5	ND: <5.0	ND: <20.0	6.3	ND: <5.0	ND: <5.0	ND: <22.0	6.4	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	63	ND: <0.05	ND: <5.0	ND: <20.0	9.6	ND: <5.0	ND: <5.0	ND: <22.0	9.8	ND: <5.0
UV/Oxidation Effluent	SP5	61	ND: <0.05	ND: <5.0	ND: <20.0	16	ND: <5.0	ND: <5.0	ND: <22.0	12	ND: <5.0
UV/Oxidation Effluent	SP5 Dup	-	-	ND: <5.0	ND: <20.0	15	ND: <5.0	NA	NA	NA	NA
GAC Midpoint	SP6A	61	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	57	ND: <0.05	NA	NA	18	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
Blank		ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M2 (Cont.)
Pilot - Scale UV/OX Treatment Analytical Results

September 27, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium	Chromium	Copper	Lead	Cadmium	Chromium	Copper	Lead
Clarifier Influent	SP1	14	8.01	NA	NA	NA	NA	ND: <5.0	ND: <22.0	15	6.1
Clarifier Effluent	SP2	20	6.86	NA	NA	NA	NA	ND: <5.0	ND: <22.0	6.4	ND: <5.0
Vortisand Filter Influent	SP3	8	1.51	NA	NA	NA	NA	ND: <5.0	ND: <22.0	5.6	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	ND: <5.0	1.19	NA	NA	NA	NA	ND: <5.0	ND: <22.0	12	ND: <5.0
UV/Oxidation Effluent	SP5	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	11	ND: <5.0
GAC Midpoint	SP6A	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
Blank		ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

September 28, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	10	5.8	ND: <0.05	ND: <20.0	9.8	ND: <5.0	ND: <5.0	ND: <22.0	22	ND: <5.0
Clarifier Effluent	SP2	20	4.63	ND: <0.05	ND: <20.0	8.3	ND: <5.0	6.1	ND: <22.0	16	ND: <5.0
Vortisand Filter Influent	SP3	ND: <5.0	1.39	ND: <0.05	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	7.2	ND: <5.0
Vortisand Filter Info. 0.45 um filtration	SP3F	ND: <5.0	0.58	NA	NA	NA	NA	NA	NA	NA	NA
Vortisand Filter Effluent/ GAC Influent	SP4	6	1.24	ND: <0.05	ND: <20.0	14	ND: <5.0	ND: <5.0	ND: <22.0	28	5.2
Vortisand Filter Info. 0.45 um filtration	SP4F	ND: <5.0	0.42	NA	NA	NA	NA	NA	NA	NA	NA
UV/Oxidation Effluent	SP5	6	ND: <0.05	ND: <0.05	ND: <20.0	19	ND: <5.0	ND: <5.0	ND: <22.0	33	8.3
GAC Midpoint	SP6A	ND: <5.0	ND: <0.05	ND: <0.05	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	ND: <5.0	ND: <0.05	ND: <0.05	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M2 (Cont.)
Pilot - Scale UV/OX Treatment Analytical Results

September 29, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	34	12	ND: <5.0	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	20	5.6
Clarifier Effluent	SP2	47	13.2	ND: <5.0	ND: <20.0	5.7	ND: <5.0	ND: <5.0	ND: <22.0	7.3	ND: <5.0
Vortisand Filter Influent	SP3	30	1.54	ND: <5.0	ND: <20.0	8.5	ND: <5.0	ND: <5.0	ND: <22.0	8.9	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	33	1.42	ND: <5.0	ND: <20.0	39	ND: <5.0	ND: <5.0	ND: <22.0	15	ND: <5.0
UV/Oxidation Effluent	SP5	23	ND: <0.05	ND: <5.0	ND: <20.0	11	ND: <5.0	ND: <5.0	ND: <22.0	17	ND: <5.0
GAC Midpoint	SP6A	35	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	27	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M3
Pilot - Scale Treatment - Filter Press Analytical Results

September 14, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Settled Sludge	SP8	7800	13 (ug/L)	NA	NA	NA	NA	NA	NA	NA	NA

September 28, 2000

Sample		TSS (mg/L)	PCBs	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium	Chromium	Copper	Lead
Settled Sludge	SP8	4620	39.8 (ug/L)	NA	NA	NA	NA	NA	NA	NA	NA
Filtrate	SP9	NA	22.8 (ug/L)	ND: <5.0	ND: <20.0	ND: <19.0	ND: <5.0	ND: <5.0 (ug/L)	ND: <22.0 (ug/L)	27 (ug/L)	ND: <5.0 (ug/L)
Filter Cake	SP10	NA	35000 (mg/kg dry)	NA	NA	NA	NA	0.74 (mg/kg dry)	200 (mg/kg dry)	200 (mg/kg dry)	74 (mg/kg dry)

NA = Not Analyzed
ND = Not Detected

Table M-4
Flow Totals by Date

DATE	Flow (gallons)						
	Cell 1 Transfer to Cell 2	Clarifier Effluent to Cell 2	Clarifier Effluent to Cell 3	Vortisand Effluent	UV/OX Influent	UV/OX Effluent	GAC Effluent/ Final Discharge
9/5/2000	17,587	22,627	0	0	0	0	0
9/6/2000	28,913	32,485	13,610	0	0	0	0
9/7/2000	125,000	0	34,403	0	0	0	0
9/8/2000	78,143	12,275	34,555	0	0	0	0
9/9/2000	0	0	33,186	0	0	0	0
9/10/2000	0	0	0	0	0	0	0
9/11/2000	0	8,300	50,371	0	0	0	0
9/12/2000	0	6,600	39,030	0	0	0	0
9/13/2000	0	7,336	48,999	0	0	0	0
9/14/2000	106,870	4,800	70,109	89,800	0	0	102,569
9/15/2000	54,974	54,570	61,928	81,300	0	0	88,847
9/16/2000	81,682	70,488	63,217	84,400	0	0	85,800
9/17/2000	0	13,459	95,705	86,350	0	0	80,849
9/18/2000	134,636	9,594	27,578	88,900	0	0	78,747
9/19/2000	103,558	37,260	24,515	70,900	0	0	59,302
9/20/2000	23,948	8,900	42,637	0	0	0	0
9/21/2000	NM	9,300	58,212	0	0	0	0
9/22/2000	NM	9,100	45,732	0	0	0	0
9/23/2000	0	0	0	0	0	0	0
9/24/2000	0	0	0	0	0	0	0
9/25/2000	NM	9,697	49,043	99,500	84,895	83,210	86,299
9/26/2000	NM	11,207	53,735	69,500	60,653	57,170	47,902
9/27/2000	0	14,001	49,264	115,300	92,769	89,450	79,412
9/28/2000	0	11,862	55,264	53,200	43,545	42,140	36,602
9/29/2000	NM	11,500	41,419	109,750	84,525	81,640	87,568
9/30/2000	0	0	0	0	0	0	0
10/1/2000	0	0	0	0	0	0	0
10/2/2000	0	0	0	0	0	0	0
10/3/2000	0	0	0	0	0	0	0
10/4/2000	0	0	0	0	0	0	54,964
10/5/2000	0	0	0	NM	0	0	62,536
10/6/2000	0	0	0	NM	0	0	0
10/7/2000	0	0	0	0	0	0	0
10/8/2000	0	0	0	0	0	0	0
10/9/2000	0	0	0	0	0	0	0
10/10/2000	0	0	0	0	0	0	0
10/11/2000	0	0	0	50,800	0	0	46,742
10/12/2000	0	0	0	0	0	0	0
10/13/2000	0	0	0	77,900	0	0	69,780
Totals	755,311	365,361	992,512	1,077,600	366,387	353,610	1,067,919

Table M-5
Turbidity Measurements Activated Carbon Pilot Scale Treatment

DATE	DAILY AVERAGE TURBIDITY MEASUREMENTS (NTU)				
	Clarifier Influent SP1	Clarifier Effluent SP2	Vortisand Influent	Vortisand Effluent/ GAC Influent	GAC Effluent
9/5/2000	NM	NM	NM	NM	NM
9/6/2000	8.75	4.00	NM	NM	NM
9/7/2000	7.29	6.75	NM	NM	NM
9/8/2000	7.53	4.84	NM	NM	NM
9/9/2000	NM	NM	NM	NM	NM
9/10/2000	NM	NM	NM	NM	NM
9/11/2000	10.31	3.50	NM	NM	NM
9/12/2000	7.46	3.71	NM	NM	NM
9/13/2000	6.70	2.89	NM	NM	NM
9/14/2000	6.18	2.41	1.15	0.89	0.58
9/15/2000	6.87	4.04	1.09	0.68	0.32
9/16/2000	6.58	2.76	1.52	0.65	0.50
9/17/2000	5.60	3.24	0.64	0.27	0.29
9/18/2000	7.12	6.90	0.78	0.54	0.30
9/19/2000	8.46	5.26	NM	NM	NM
9/20/2000	10.13	3.59	NM	NM	NM
9/21/2000	16.0	3.90	NM	NM	NM
9/22/2000	17.25	4.8	NM	NM	NM
9/23/2000	NM	NM	NM	NM	NM
9/24/2000	NM	NM	NM	NM	NM
Average	8.81	4.17	1.04	0.61	0.40

NM = Not Measured

Table M-6
Turbidity Measurements UV/Oxidation Pilot Scale Treatment

DATE	DAILY AVERAGE TURBIDITY MEASUREMENTS (NTU)					
	Clarifier Influent SP1	Clarifier Effluent SP2	Vortisand Influent	Vortisand Effluent/ UV/OX Influent	UV/OX Effluent/ GAC Influent	GAC Effluent
9/25/2000	15.85	5.54	1.24	0.55	0.56	NM
9/26/2000	14.37	5.78	1.26	0.52	0.43	0.03
9/27/2000	11.12	4.79	0.59	0.63	0.78	0.03
9/28/2000	7.25	4.42	0.83	0.71	0.63	0.03
9/29/2000	19.93	4.31	0.85	0.48	0.37	0.11
Average	13.70	4.97	0.95	0.58	0.55	0.05

NM = Not Measured

Table M-7
Vortisand Filtration Performance
Turbidity Measurements

DATE	Vortisand Turbiduty (NTU)		
	Vortisand Effluent/ UV/OX Influent	UV/OX Effluent/ GAC Influent	GAC Effluent
10/4/2000	2.96	2.49	NM
10/4/2000	2.92	2.41	NM
10/4/2000	30 - 32	NM	NM
10/5/2000	7.9 - 8.1	5.3 - 5.5	NM
10/5/2000	4.8	7.6 - 7.2	NM
10/6/2000	NM	NM	NM
10/7/2000	NM	NM	NM
10/8/2000	NM	NM	NM
10/9/2000	NM	NM	NM
10/10/2000	NM	NM	NM
10/11/2000	2.7 - 2.8	2.9 - 3.0	0.90
10/11/2000	37 - 39	6.1 - 6.2	1.4 - 1.5
10/11/2000	5.5	NM	NM
10/11/2000	16 - 18	6.3 - 6.5	1.5 - 1.6
10/12/2000	NM	NM	NM
10/13/2000	NM	NM	NM
10/13/2000	9.1	6.0	1.99
10/13/2000	9.5	5.3 - 5.6	NM
10/13/2000	9.3	5.9 - 6.0	NM
10/13/2000	9.4 - 9.5	8.0 - 8.3	0.2
10/13/2000	9.3	7.1 - 7.3	NM
10/13/2000	8.5 - 8.6	3.6 - 3.8	NM
10/13/2000	8.8 - 9.0	3.3 - 3.7	NM
10/13/2000	9.00	3.1 - 3.2	1.0 - 1.2
10/14/2000	NM	NM	NM
10/15/2000	NM	NM	NM
10/16/2000	NM	NM	NM

NM = Not Measured

TABLE M-8
UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	1200	23.71	1706.84	1	4
2	1200	29.72	2139.67	1	5
3	1200	33.23	2392.86	1	6
4	1200	35.73	2572.51	1	6
5	1200	37.66	2711.85	1	7
6	1200	39.25	2825.70	1	7
7	1200	40.58	2921.96	1	7
8	1200	41.74	3005.34	1	8
9	1200	42.76	3078.89	1	8
10	1200	43.68	3144.68	1	8
11	1200	44.50	3204.20	1	8
12	1200	45.26	3258.54	1	8
13	1200	45.95	3308.51	1	8
14	1200	46.59	3354.79	1	9
15	1200	47.19	3397.87	1	9
16	1200	47.75	3438.77	1	9
17	1200	48.28	3476.03	1	9
18	1200	48.77	3511.72	1	9
19	1200	49.24	3545.48	1	9
20	1200	49.69	3577.51	1	9
21	1200	50.11	3607.98	1	9
22	1200	50.51	3637.03	1	9
23	1200	50.90	3664.79	1	9
24	1200	51.27	3691.30	1	10
25	1200	51.62	3716.85	1	10
1	1400	27.71	1991.38	1	5
2	1400	29.72	2496.29	1	6
3	1400	33.23	2791.68	1	7
4	1400	35.73	3001.26	1	8
5	1400	37.66	3163.82	1	8
6	1400	39.25	3296.65	1	8
7	1400	40.58	3408.95	1	9
8	1400	41.74	3506.23	1	9
9	1400	42.76	3592.04	1	9
10	1400	43.68	3668.79	1	9
11	1400	44.50	3738.20	1	10
12	1400	45.26	3801.62	1	10
13	1400	45.95	3859.58	1	10
14	1400	46.59	3913.92	1	10
15	1400	47.19	3964.18	1	10
16	1400	47.75	4011.20	1	10
17	1400	48.28	4055.37	1	10
18	1400	48.77	4097.01	1	11
19	1400	49.24	4136.40	1	11
20	1400	49.69	4173.77	1	11
21	1400	50.11	4209.31	1	11
22	1400	50.51	4243.20	1	11
23	1400	50.90	4275.50	1	11
24	1400	51.27	4306.59	1	11
25	1400	51.62	4336.33	1	11

TABLE M-8
CONTINUATION OF UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	1000	23.71	1422.37	1	3
2	1000	29.72	1783.06	1	4
3	1000	33.23	1994.05	1	5
4	1000	35.73	2143.76	1	5
5	1000	37.66	2259.87	1	6
6	1000	39.25	2354.75	1	6
7	1000	40.58	2434.96	1	6
8	1000	41.74	2504.45	1	6
9	1000	42.76	2565.74	1	6
10	1000	43.68	2620.57	1	7
11	1000	44.50	2670.16	1	7
12	1000	45.26	2715.44	1	7
13	1000	45.95	2757.09	1	7
14	1000	46.59	2799.66	1	7
15	1000	47.19	2831.56	1	7
16	1000	47.75	2865.14	1	7
17	1000	48.28	2896.69	1	7
18	1000	48.77	2926.43	1	7
19	1000	49.24	2954.57	1	7
20	1000	49.69	2981.26	1	8
21	1000	50.11	3006.65	1	8
22	1000	50.51	3030.86	1	8
23	1000	50.90	3053.99	1	8
24	1000	51.27	3076.14	1	8
25	1000	51.62	3097.38	1	8
1	800	23.71	1137.89	1	2
2	800	29.72	1426.45	1	3
3	800	33.23	1595.24	1	4
4	800	35.73	1715.00	1	4
5	800	37.66	1807.90	1	4
6	800	39.25	1883.80	1	4
7	800	40.58	1947.97	1	5
8	800	41.74	2003.56	1	5
9	800	42.76	2052.59	1	5
10	800	43.68	2096.45	1	5
11	800	44.50	2136.13	1	5
12	800	45.26	2172.35	1	5
13	800	45.95	2205.68	1	5
14	800	46.59	2236.53	1	5
15	800	47.19	2265.25	1	6
16	800	47.75	2292.12	1	6
17	800	48.28	2317.35	1	6
18	800	48.77	2341.15	1	6
19	800	49.24	2363.66	1	6
20	800	49.69	2385.01	1	6
21	800	50.11	2405.32	1	6
22	800	50.51	2424.69	1	6
23	800	50.90	2443.19	1	6
24	800	51.27	2460.91	1	6
25	800	51.62	2477.90	1	6

TABLE M-8
CONTINUATION OF UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	600	23.71	853.42	1	2
2	600	29.72	1069.84	1	2
3	600	33.23	1196.43	1	3
4	600	35.37	1286.25	1	3
5	600	37.66	1355.92	1	3
6	600	39.25	1412.83	1	3
7	600	40.58	1460.98	1	3
8	600	41.74	1502.67	1	3
9	600	42.76	1539.44	1	4
10	600	43.68	1572.34	1	4
11	600	44.50	1602.10	1	4
12	600	45.26	1629.27	1	4
13	600	45.95	1654.26	1	4
14	600	46.59	1677.32	1	4
15	600	47.19	1698.94	1	4
16	600	47.75	1719.02	1	4
17	600	48.28	1738.01	1	4
18	600	48.77	1755.86	1	4
19	600	49.24	1772.74	1	4
20	600	49.69	1788.76	1	4
21	600	50.11	1803.99	1	4
22	600	50.51	1818.51	1	4
23	600	50.90	1832.39	1	4
24	600	51.27	1845.68	1	4
25	600	51.62	1858.43	1	4
1	400	23.71	569.93	1	1
2	400	29.72	713.22	1	1
3	400	33.23	797.62	1	1
4	400	35.73	857.50	1	2
5	400	37.66	903.95	1	2
6	400	39.25	941.90	1	2
7	400	40.58	973.99	1	2
8	400	41.74	1001.78	1	2
9	400	42.76	1026.36	1	2
10	400	43.68	1048.23	1	2
11	400	44.50	1068.07	1	2
12	400	45.26	1086.18	1	2
13	400	45.95	1102.80	1	2
14	400	46.59	1118.26	1	2
15	400	47.19	1132.64	1	2
16	400	47.75	1146.06	1	2
17	400	48.28	1158.85	1	2
18	400	48.77	1170.57	1	3
19	400	49.24	1181.83	1	3
20	400	49.69	1192.50	1	3
21	400	50.11	1202.66	1	3
22	400	50.51	1212.34	1	3
23	400	50.90	1221.60	1	3
24	400	51.27	1230.45	1	3
25	400	51.62	1238.93	1	3

FOSTER WHEELER ENVIRONMENTAL CORPORATION

BY MARTITA MULLEN DATE 1/5/01 SHEET 3 OF

CHKD. BY DATE OFS NO. DEPT. NO.

CLIENT USACE

PROJECT NBH - WTP PILOT SCALE TEST

SUBJECT UV/OX SYSTEM SIZING CALCULATIONS

B - CALCULATIONS FOR BENCH SCALE DATA

① Flowrate = Batch
UV Dose Tested = 24 KWH/1000gal
C_i = 0.75 ppb
C_f = 0.060 ppb

② Calculation of Electrical Energy per Order (EE/O):

$$EE/O = \frac{\text{UV Dose}}{\log(C_i/C_f)} = \frac{24\ KWH/1000gal}{\log(.75ppb/0.060ppb)} = 21.88\ \frac{KWH/1000gal}{order}$$

③ Calculation of UV Dose Required for anticipated influent concentration and effluent discharge limits. (C_i = 1 ppb and C_f = 0.065 ppb)

$$\text{UV Dose} = EE/O * \log(C_i/C_f) = 21.88\ \frac{KWH/1000gal}{order}\left(\log\frac{1ppb}{0.065ppb}\right)$$

UV Dose = 26 KWH/1000gal

④ Calculation of the number of KWH required to treat 1ppb at 1200 gpm:

$$\text{Lamp Power} = \frac{\text{UV dose} \times \text{flow (gpm)} \times 60\ min/hr}{1000\ (gal/1000\ gal)}$$

$$= \frac{(26\ KWH/1000\ gal)(1200\ gpm)(60\ min/hr)}{1000\ (gal/1000\ gal)}$$

= 1870 KW

⑤ Number of Individual Units required to provide a lamp power of 1870 KW:

1 - 270 KW unit and 5 - 360 KW units - total power = 2070 KW

Appendix N
Health & Safety

Note: The New Bedford Harbor Project Health and Safety Plan was distributed to USACE-NAE EPA Region I and Massachusetts DEP prior to the start of the PDFT. Also, a copy has been filed in the Foster Wheeler project file.

Click here to go to Appendix O