

# **APPENDICES**

**TO THE  
SUPPORTING TECHNICAL ANALYSIS FOR 301(H) WAIVER RENEWAL  
FOR THE TAFUNA SEWAGE TREATMENT PLANT**

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**Appendix 1: Effluent Monitoring Data**

**Appendix 2: Receiving Water Monitoring Data**

**Appendix 3: Results of Hydraulic Analyses of Diffuser Configurations**

**Appendix 4: Diffuser Initial Dilution Model Predictions**

**Appendix 1:**  
**Effluent Monitoring Data**

<b>Tafuna WWTP Effluent Minimum Daily Flow (MGD) 1999-2003</b>								
<i>NPDES Permit Limit (Annual Average) = 2.0 MGD</i>								
<i>Highlighted Values = Range of Minimum Flow</i>								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	0.99	0.18	2.11	1.05	1.51	0.18	1.17	2.11
FEB	0.91	1.00	0.24	0.81	1.38	0.24	0.87	1.38
MAR	0.56	1.07	1.56	0.83	0.87	0.56	0.98	1.56
APR	0.5	0.82	1.08	0.72	0.88	0.50	0.80	1.08
MAY	0.21	1.00	1.49	0.97	0.00	0.00	0.73	1.49
JUN	0.52	0.77	1.49	0.71	1.15	0.52	0.93	1.49
JUL	0.25	2.75	0.63	1.13	1.17	0.25	1.19	2.75
AUG	0.76	0.02	0.69	1.12	1.22	0.02	0.76	1.22
SEP	0.11	1.76	0.76	1.20	0.99	0.11	0.96	1.76
OCT	0.75	0.83	0.79	0.94	0.90	0.75	0.84	0.94
NOV	0.86	0.65	1.08	1.15	1.28	0.65	1.00	1.28
DEC	1.06	2.29	0.92	0.71	0.86	0.71	1.17	2.29
<b>Minimum</b>	0.11	0.02	0.24	0.71	0.00	5-year Average Minimum Daily Flow = 0.95 mgd		
<b>Average</b>	0.62	1.10	1.07	0.95	1.02			
<b>Maximum</b>	1.06	2.75	2.11	1.20	1.51			

<b>Tafuna WWTP Effluent Maximum Daily Flow (MGD) 1999-2003</b>								
<i>NPDES Permit Limit (Annual Average) = 2.0 MGD</i>								
<i>Highlighted Values = Range of Maximum Flow</i>								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	1.47	2.18	3.36	2.50	2.17	1.47	2.34	3.36
FEB	1.53	1.46	3.75	1.83	2.32	1.46	2.18	3.75
MAR	1.22	4.85	2.49	1.67	3.18	1.22	2.68	4.85
APR	0.93	1.72	5.41	2.14	3.97	0.93	2.83	5.41
MAY	1.41	2.98	2.00	2.17	3.68	1.41	2.45	3.68
JUN	0.86	5.23	1.91	2.43	2.26	0.86	2.54	5.23
JUL	1.10	5.42	1.90	2.23	2.69	1.10	2.67	5.42
AUG	1.46	5.69	1.63	2.05	2.20	1.46	2.61	5.69
SEP	2.01	2.65	2.00	1.89	2.35	1.89	2.18	2.65
OCT	1.53	3.00	1.99	2.53	2.19	1.53	2.25	3.00
NOV	1.52	5.80	1.75	2.93	2.69	1.52	2.94	5.80
DEC	1.40	3.13	2.12	2.71	2.86	1.40	2.44	3.13
<b>Minimum</b>	0.86	1.46	1.63	1.67	2.17	5-year Average Maximum Daily Flow = 2.51 mgd		
<b>Average</b>	1.37	3.68	2.53	2.26	2.71			
<b>Maximum</b>	2.01	5.80	5.41	2.93	3.97			

**Tafuna WWTP Effluent Average Daily Flow (MGD) 1999-2003**  
**NPDES Permit Limit (Annual Average) = 2.0 MGD**  
**Highlighted Values = Range of Average Flow**

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum		
JAN	1.21	1.26	2.82	1.42	1.84	1.21	1.71	2.82		
FEB	1.19	1.19	2.49	1.35	1.88	1.19	1.62	2.49		
MAR	0.88	2.29	1.89	1.29	1.84	0.88	1.64	2.29		
APR	0.74	1.28	1.79	1.46	1.91	0.74	1.44	1.91		
MAY	0.69	1.60	1.74	1.74	2.00	0.69	1.55	2.00		
JUN	0.70	3.13	1.70	1.63	1.76	0.70	1.78	3.13		
JUL	0.74	4.91	1.57	1.66	1.78	0.74	2.13	4.91		
AUG	0.99	2.00	1.19	1.55	1.76	0.99	1.50	2.00		
SEP	1.13	2.01	1.37	1.70	1.82	1.13	1.61	2.01		
OCT	1.20	1.97	1.35	1.70	1.61	1.20	1.57	1.97		
NOV	1.18	2.76	1.4	1.79	1.88	1.18	1.80	2.76		
DEC	1.23	2.80	1.51	1.91	1.88	1.23	1.87	2.80		
						5-year Average Daily Flow = 1.68 mgd				
Minimum	0.69	1.19	1.19	1.29	1.61					
Average	0.99	2.27	1.74	1.60	1.83					
Maximum	1.23	4.91	2.82	1.91	2.00					

Tafuna WWTP Effluent Minimum Monthly BOD (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 100 mg/l								
Highlighted Values = Range of Minimum BOD								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	24	69	ns	ns	54	24	49	69
FEB	32	70	ns	60	42	32	51	70
MAR	26	ns	ns	100	69	26	65	100
APR	26	ns	ns	100	39	26	55	100
MAY	26	ns	18	75	54	18	43	75
JUN	28	ns	26	40	50	26	36	50
JUL	24	ns	27	65	69	24	46	69
AUG	22	ns	12	51	126	12	53	126
SEP	30	ns	24	72	117	24	61	117
OCT	27	ns	30	84	97	27	60	97
NOV	32	ns	21	75	88	21	54	88
DEC	18	ns	34	40	117	18	52	117
Minimum	18	69	12	40	39	5-year Average Minimum BOD = 52 mg/l		
Average	26	70	24	69	77			
Maximum	32	70	34	100	126			
ns = not sampled								

Tafuna WWTP Effluent Maximum Monthly BOD (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 100 mg/l								
Highlighted Values = Range of Maximum BOD								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	32	45	ns	ns	54	32	44	54
FEB	34	36	ns	61	53	34	46	61
MAR	38	ns	ns	45	48	38	44	48
APR	60	ns	ns	32	68	32	53	68
MAY	28	ns	76	60	48	28	53	76
JUN	43	ns	50	46	51	43	48	51
JUL	38	ns	69	60	96	38	66	96
AUG	48	ns	84	56	64	48	63	84
SEP	38	ns	85	70	87	38	70	87
OCT	68	ns	51	81	70	51	68	81
NOV	42	ns	48	56	77	42	56	77
DEC	36	ns	38	48	64	36	47	64
Minimum	28	36	38	32	48	5-year Average Maximum BOD = 55 mgd		
Average	42	41	63	56	65			
Maximum	68	45	85	81	96			
ns = not sampled								

**Tafuna WWTP Effluent Average BOD (mg/l) 1999-2003**  
**NPDES Permit Limit = Average Monthly 100 mg/l**  
**Highlighted Values = Range of Average BOD**

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	29	34	ns	ns	36	29	33	36
FEB	33	28	ns	41	41	28	36	41
MAR	31	ns	ns	33	44	31	36	44
APR	39	ns	ns	30	49	30	39	49
MAY	23	ns	41	45	42	23	38	45
JUN	33	ns	42	29	45	29	37	45
JUL	32	ns	42	44	70	32	47	70
AUG	33	ns	34	37	64	33	42	64
SEP	34	ns	48	52	75	34	52	75
OCT	44	ns	43	49	64	43	50	64
NOV	38	ns	32	47	67	32	46	67
DEC	29	ns	36	36	57	29	40	57
<b>Minimum</b>	23	28	32	29	36	5-year Monthly Average BOD = 41mg/l		
<b>Average</b>	33	31	40	40	55			
<b>Maximum</b>	44	34	48	52	75			
ns = not sampled								

Tafuna WWTP Effluent Minimum TSS (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 75 mg/l								
Highlighted Values = Range of Minimum TSS								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	12	12	23	17	15	12	16	23
FEB	15	11	27	23	28	11	21	28
MAR	2	17	25	48	23	2	23	48
APR	13	15	26	46	25	13	25	46
MAY	12	6	26	36	26	6	21	36
JUN	14	2	23	2	20	2	12	23
JUL	13	16	39	26	16	13	22	39
AUG	18	15	17	25	12	12	17	25
SEP	11	30	33	23	53	11	30	53
OCT	7	27	15	19	3	3	14	27
NOV	10	21	31	10	27	10	20	31
DEC	12	26	14	13	10	10	15	26
Minimum	2	2	14	2	3	5-year Average Minimum TSS = 52 mg/l		
Average	12	17	25	24	22			
Maximum	18	30	39	48	53			

Tafuna WWTP Effluent Maximum TSS (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 75 mg/l								
Highlighted Values = Range of Maximum TSS								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	80	35	52	45	64	35	55	80
FEB	60	30	39	65	36	30	46	65
MAR	220	50	43	87	54	43	91	220
APR	194	30	35	72	64	30	79	194
MAY	162	16	102	55	33	16	74	162
JUN	113	33	74	50	48	33	64	113
JUL	190	24	52	65	52	24	77	190
AUG	250	50	57	70	78	50	101	250
SEP	232	36	64	73	78	36	97	232
OCT	140	64	80	47	67	47	80	140
NOV	190	65	68	37	50	37	82	190
DEC	190	42	57	20	81	20	78	190
Minimum	60	16	35	20	33	5-year Average Maximum TSS = 77 mg/l		
Average	168	40	60	57	59			
Maximum	250	65	102	87	81			

Note: Maximum Monthly TSS without 1999 is 102 mg/l

**Tafuna WWTP Effluent Average Monthly TSS (mg/l) 1999-2003**  
**NPDES Permit Limit = Average Monthly 75 mg/l**  
**Highlighted Values = Range of Average TSS**

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	18	26	41	29	38	18	30	41
FEB	22	16	34	48	32	16	30	48
MAR	13	32	35	67	33	13	36	67
APR	20	20	30	55	38	20	33	55
MAY	18	12	57	44	29	12	32	57
JUN	15	19	52	28	29	15	29	52
JUL	23	19	47	39	31	19	32	47
AUG	30	29	36	45	50	29	38	50
SEP	19	33	48	50	69	19	44	69
OCT	23	43	42	31	36	23	35	43
NOV	17	48	46	25	39	17	35	48
DEC	25	35	32	16	40	16	30	40
<b>Minimum</b>	13	12	30	16	29	5-year Monthly Average TSS = 34 mg/l		
<b>Average</b>	20	28	42	40	39			
<b>Maximum</b>	30	48	57	67	69			

Tafuna WWTP Effluent Average Monthly Minimum Settleable Solids (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 1 mg/l								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
FEB	0	0.1	0.1	0.1	0.0	0.0	0.1	0.1
MAR	0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
APR	0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
MAY	0	0.1	0.0	0.1	0.1	0.0	0.1	0.1
JUN	0	0.1	0.1	0.1	0.0	0.0	0.1	0.1
JUL	0	0.1	0.0	0.1	0.1	0.0	0.1	0.1
AUG	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SEP	0	0.0	0.0	0.1	0.1	0.0	0.0	0.1
OCT	0	0.1	0.1	0.1	0.1	0.0	0.1	0.1
NOV	0	0.1	0.0	0.1	0.1	0.0	0.1	0.1
DEC	0	0.1	0.0	0.1	0.1	0.0	0.1	0.1
Minimum	0.0	0.0	0.0	0.0	0.0	5-year Average Minimum Settleable Solids = 0.1 mg/l		
Average	0.0	0.1	0.1	0.1	0.1			
Maximum	0.1	0.1	0.1	0.1	0.1			

Tafuna WWTP Effluent Average Monthly Maximum Settleable Solids (mg/l) 1999-2003								
NPDES Permit Limit = Average Monthly 1 mg/l								
Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
FEB	0.5	0.2	0.4	0.4	0.3	0.2	0.4	0.5
MAR	0.5	0.2	0.5	0.5	0.4	0.2	0.4	0.5
APR	0.1	0.2	0.4	0.4	0.3	0.1	0.3	0.4
MAY	0.5	0.2	0.4	0.4	0.3	0.2	0.4	0.5
JUN	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
JUL	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
AUG	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
SEP	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
OCT	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.4
NOV	0.1	0.3	0.4	0.4	0.2	0.1	0.3	0.4
DEC	0.2	0.3	0.3	0.3	0.1	0.1	0.2	0.3
Minimum	0.1	0.2	0.3	0.3	0.1	5-year Average Maximum Settleable Solids = 0.3 mg/l		
Average	0.3	0.3	0.4	0.4	0.3			
Maximum	0.5	0.3	0.5	0.5	0.4			



**Tafuna WWTP Effluent Average Monthly Settleable Solids (mg/l)  
1999-2003**

*NPDES Permit Limit = Average Monthly 1 mg/l*

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2
FEB	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2
MAR	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2
APR	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2
MAY	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2
JUN	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2
JUL	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2
AUG	0.1	0.2	0.3	0.2	0.1	0.1	0.2	0.3
SEP	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.2
OCT	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2
NOV	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2
DEC	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2
<b>Minimum</b>	0.1	0.1	0.1	0.1	0.1	5-year Monthly Average Settleable Solids = 0.1 mg/l		
<b>Average</b>	0.1	0.2	0.2	0.2	0.1			
<b>Maximum</b>	0.1	0.2	0.3	0.2	0.2			

**Tafuna WWTP Effluent Monthly Minimum pH (SU) 1999-2003**  
**NPDES Permit Limit = greater than 6.5 and less than 8.6**  
**Highlighted Values = Range of Minimum pH**

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	7.2	6.3		6.6	6.8	6.3	6.7	7.2
FEB	6.7	6.0	6.7		6.9	6.0	6.6	6.9
MAR	6.1	6.3	6.6		6.8	6.1	6.5	6.8
APR	6.1	6.4			6.8	6.1	6.4	6.8
MAY	6.2		6.5	6.4	6.9	6.2	6.5	6.9
JUN	6.2	6.3	6.7	6.4	6.9	6.2	6.5	6.9
JUL	6.1	6.5		6.5	7.0	6.1	6.5	7.0
AUG	6.2	6.4	6.5	6.6	7.0	6.2	6.5	7.0
SEP		6.2	6.7	6.7	6.5	6.2	6.5	6.7
OCT		6.4	6.6	6.7	6.7	6.4	6.6	6.7
NOV	6.4	6.4	6.7	6.8	6.8	6.4	6.6	6.8
DEC	6.3	6.3	6.7	6.9	6.8	6.3	6.6	6.9
<b>Minimum</b>	6.1	6.0	6.5	6.4	6.5	5-year Average Minimum pH = 6.5		
<b>Average</b>	6.4	6.3	6.6	6.6	6.8			
<b>Maximum</b>	7.2	6.5	6.7	6.9	7.0			

**Tafuna WWTP NPDES Effluent Monthly Maximum pH (SU) 1999-2003**  
**NPDES Permit Limit = greater than 6.5 and less than 8.6**  
**Highlighted Values = Range of Maximum pH**

Month	1999	2000	2001	2002	2003	Minimum	Average	Maximum
JAN	7.3	7.2	6.7	7.0	7.2	6.7	7.1	7.3
FEB	7.1	7.0	7.0	6.9	7.5	6.9	7.1	7.5
MAR	7.4	7.1	7.0	6.9	7.3	6.9	7.1	7.4
APR	7.2	7.2	6.8	7.0	7.2	6.8	7.1	7.2
MAY	7.1	6.9	7.0	6.9	7.4	6.9	7.1	7.4
JUN	7.2	7.1	7.0	6.7	7.5	6.7	7.1	7.5
JUL	7.2	7.1	6.9	6.8	7.4	6.8	7.1	7.4
AUG	7.2	6.9	6.9	6.8	7.3	6.8	7.0	7.3
SEP	7.2	6.9	7.2	7.0	7.4	6.9	7.1	7.4
OCT	7.3	6.7	7.1	7.3	7.6	6.7	7.2	7.6
NOV	7.1	6.8	7.0	7.3	7.0	6.8	7.0	7.3
DEC	7.1	6.7	7.1	7.2	7.0	6.7	7.0	7.2
<b>Minimum</b>	7.1	6.7	6.7	6.7	7.0	5-year Average Maximum pH = 7.1		
<b>Average</b>	7.2	7.0	7.0	7.0	7.3			
<b>Maximum</b>	7.4	7.2	7.2	7.3	7.6			

**Tafuna WWTP Effluent Toxicity Testing Results (2000-2004)**  
**Sea Urchin Fertilization Toxicity Test**

Chronic Toxicity Targets are:

Maximum Daily  $TU_C = 373$  and Monthly Average  $TU_C = 173$

Test Date(quarter-year)	Date Sampled	Date Reported	Test Results			
			NOEC	LOEC	Tuc	EC50
3rd - 2000	8/20-21/2000	09/15/00	1.2	2.4	83.3	-
4th-2000	11/12-13/2000	12/03/00	0.6	1.2	166.7	-
1st-2001	2/26-27/2001	03/12/01	> 2.312	> 2.312	<43.3	-
2nd-2001	5/6-7/2001	05/18/01	> 2.312	> 2.312	<43.3	-
3rd - 2001	7/29-30/2001		>2.312	>2.312	<43.3	-
4th-2001	12/9-10/2001	12/20/01	>2.312	>2.312	<43.3	-
1st-2002						
2nd-2002	5/19-20/2002	09/09/02	1.156	2.312	86.5	1.91
3rd-2002	8/25-26/2002	11/21/02	1.16	2.31	86.2	N/A
4th-2002						
1st-2003	2/23-24/2003	04/08/03	0.578	1.156	173	>2.312
2nd-2003						
3rd-2003	5/11-12/2003	06/12/03	0.578	1.156	173	1.24
4th-2003	8/27/03	12/09/03	>2.312	>2.312	<43.3	>2.312
1st-2004	11/26/03	01/08/04	1.156	2.312	86.5	1.35
2nd-2004	2/2/04	03/01/04	1.156	2.312	86.5	>2.312