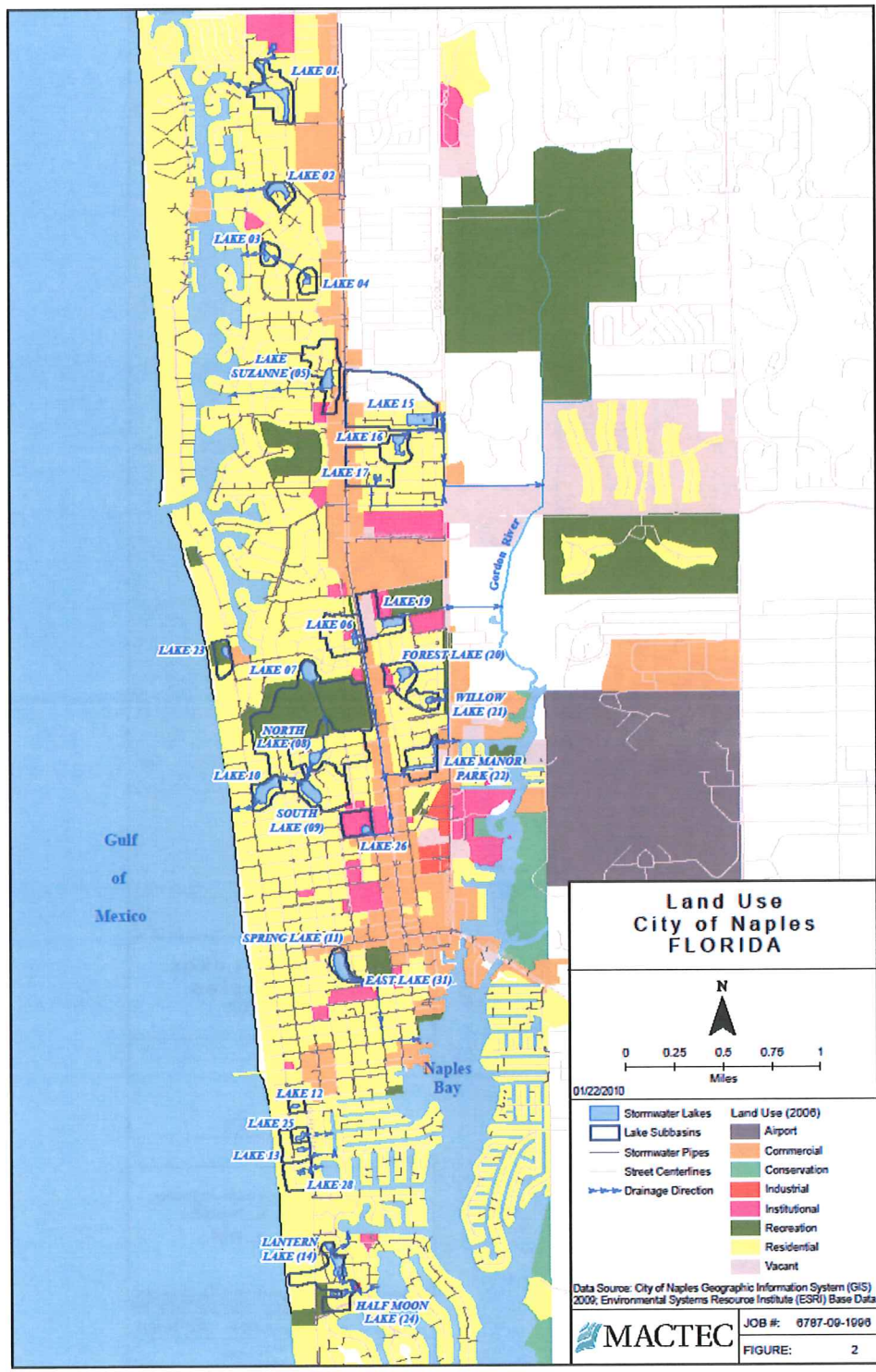


Figures
City of Naples Lake Maintenance and Improvement Program





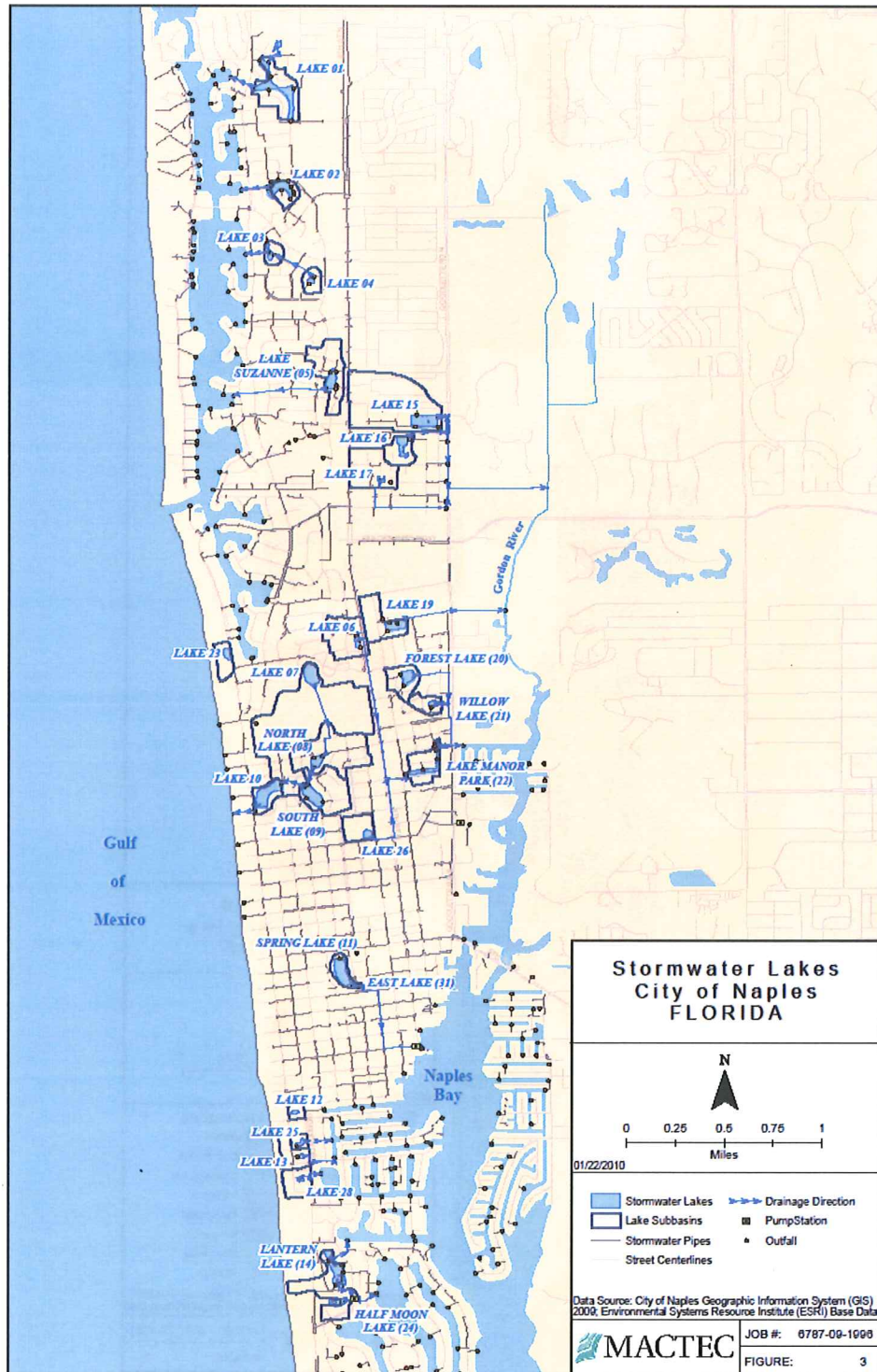
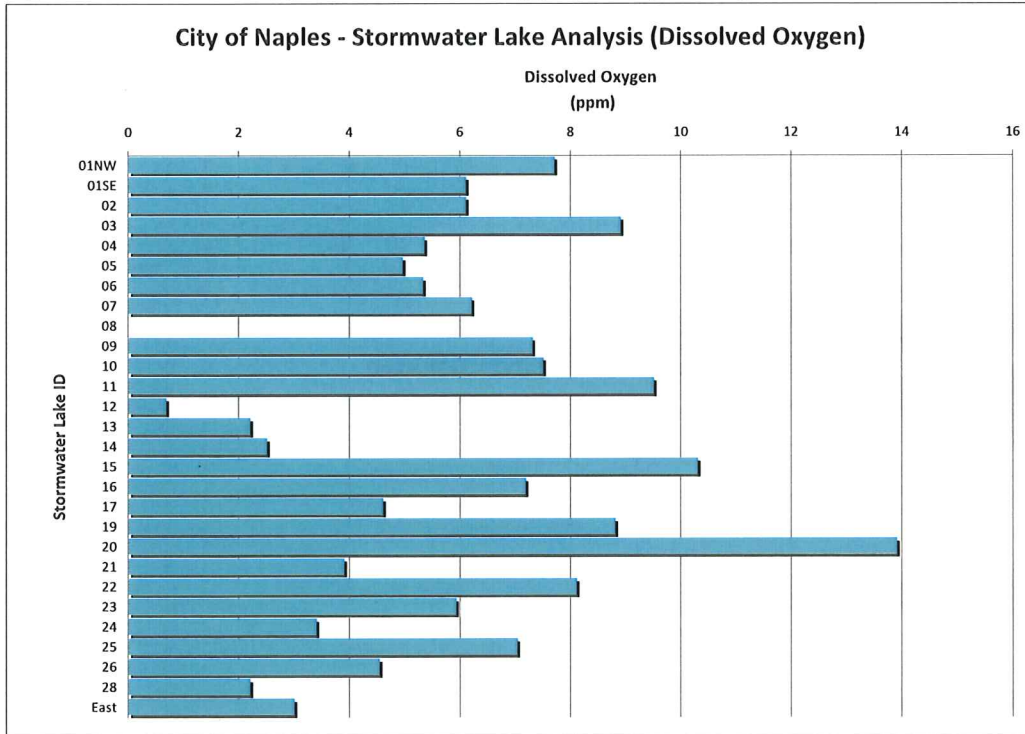
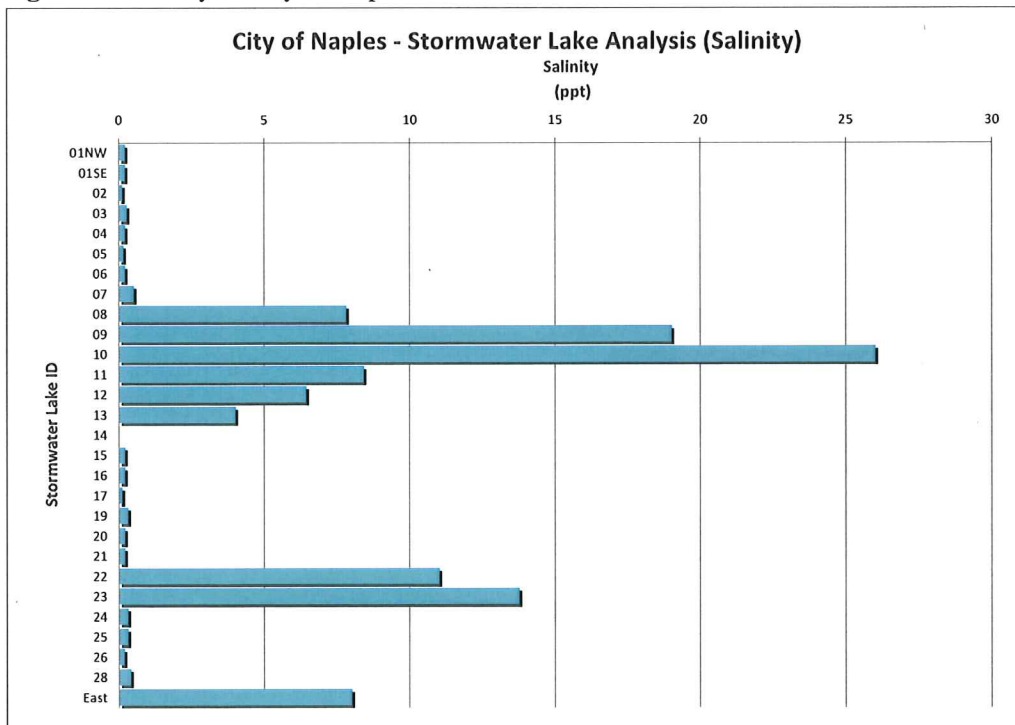


Figure 4. Dissolved Oxygen Concentrations (ppm) in City of Naples Stormwater Lakes



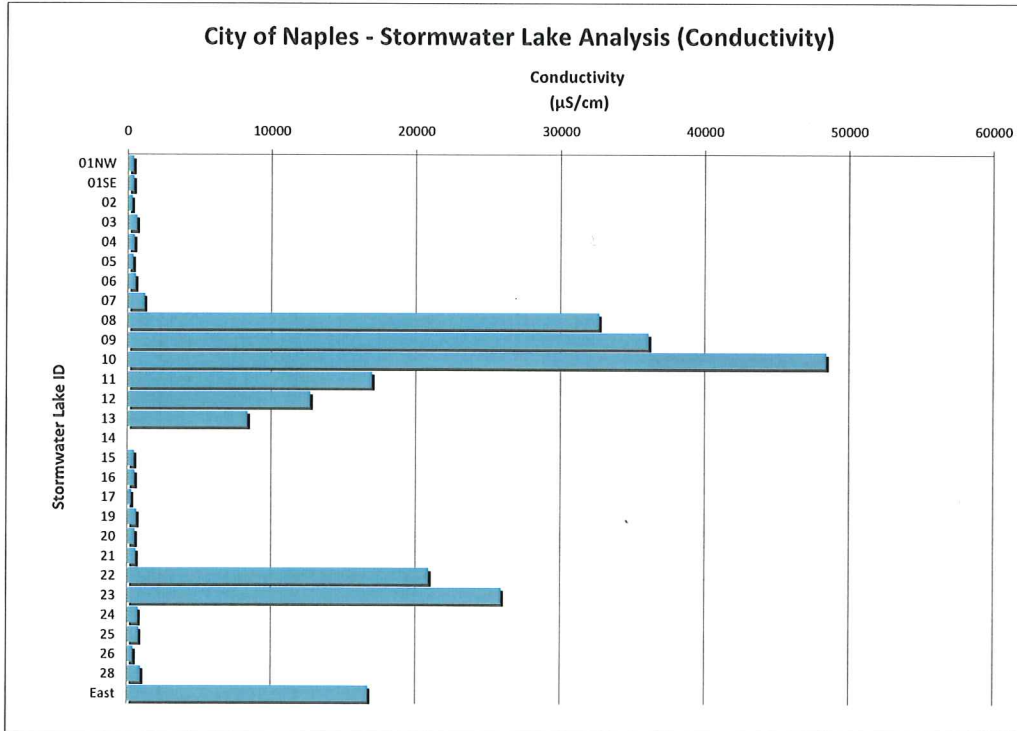
Prepared by: KKS Reviewed by: SEM
 Equipment malfunction during sampling at Lake 08

Figure 5. Salinity in City of Naples Stormwater Lakes



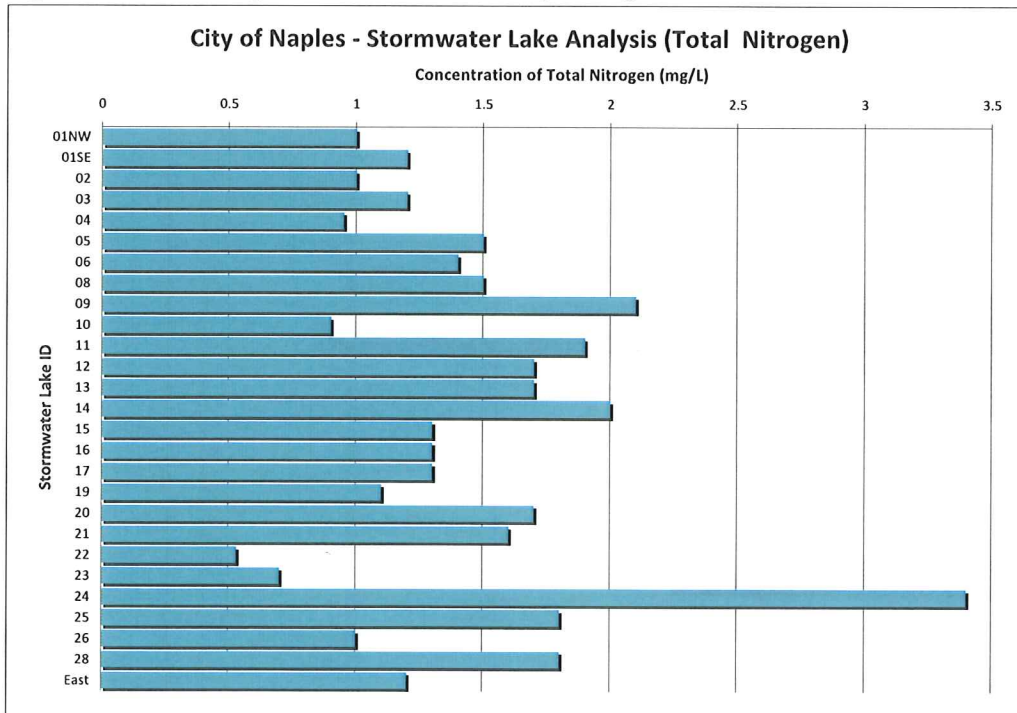
Prepared by: KKS Reviewed by: SEM
 Salinity measured at Lake 14 out of range of instrument

Figure 6. Conductivity in City of Naples Stormwater Lakes



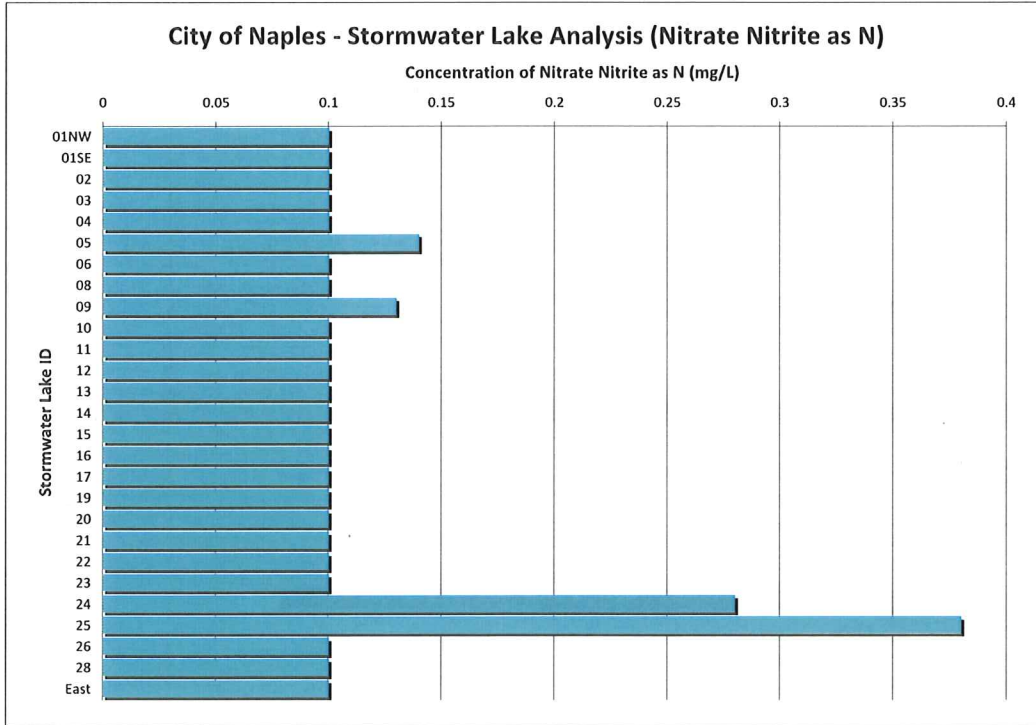
Prepared by: KKS Reviewed by: SEM
 Conductivity measured at Lake 14 out of range of instrument

Figure 7. Total Nitrogen Concentrations in City of Naples Stormwater Lakes



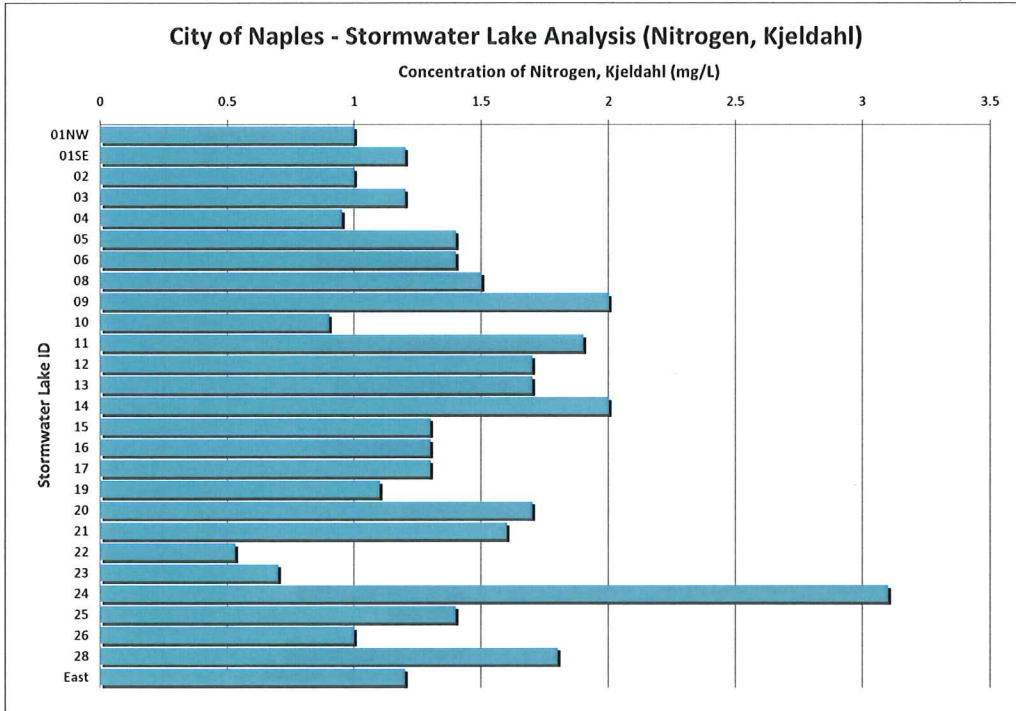
Prepared by: KKS Reviewed by: SEM

Figure 8. Nitrate-Nitrite Nitrogen Concentrations in City of Naples Stormwater Lakes



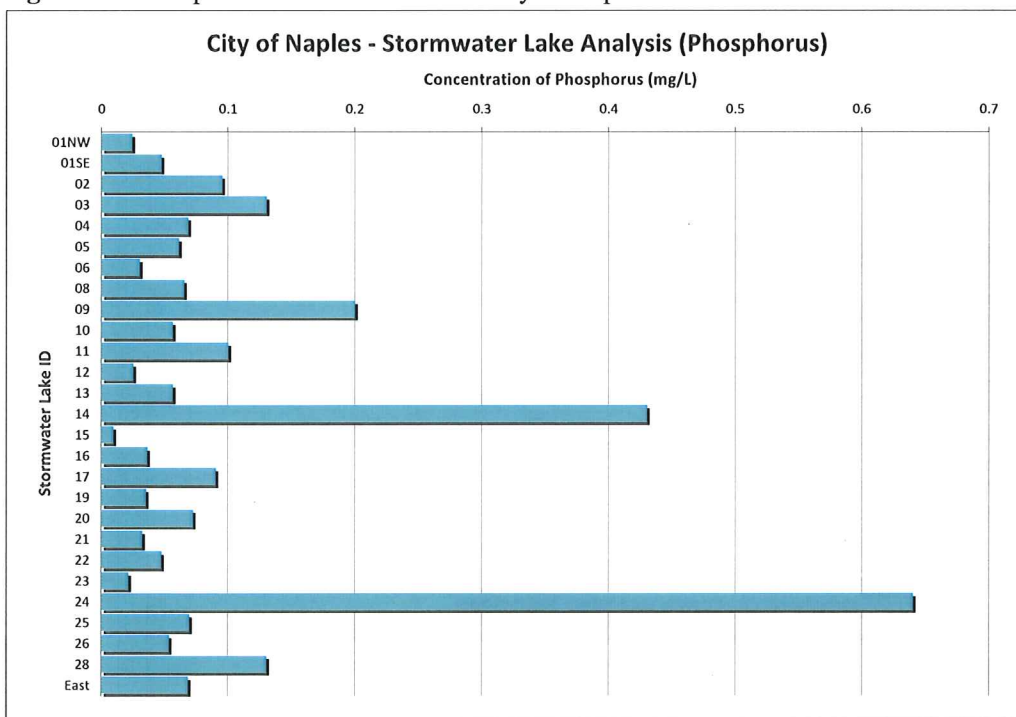
Prepared by: KKS Reviewed by: SEM

Figure 9. Total Kjeldahl Nitrogen Concentrations in City of Naples Stormwater Lakes



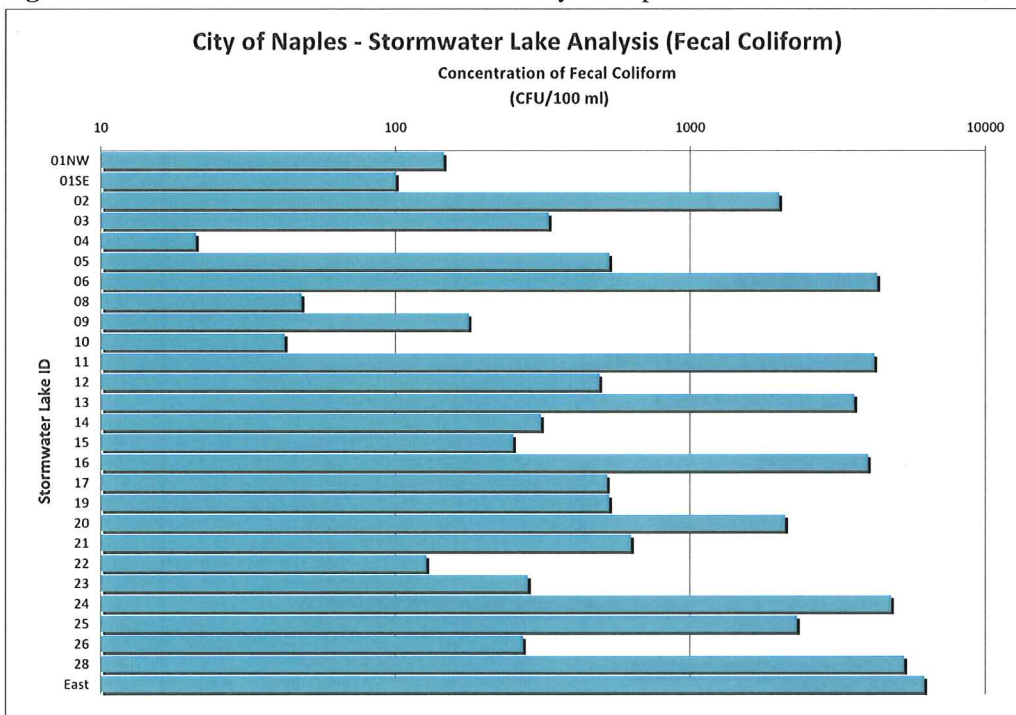
Prepared by: KKS Reviewed by: SEM

Figure 10. Phosphorus Concentrations in City of Naples Stormwater Lakes



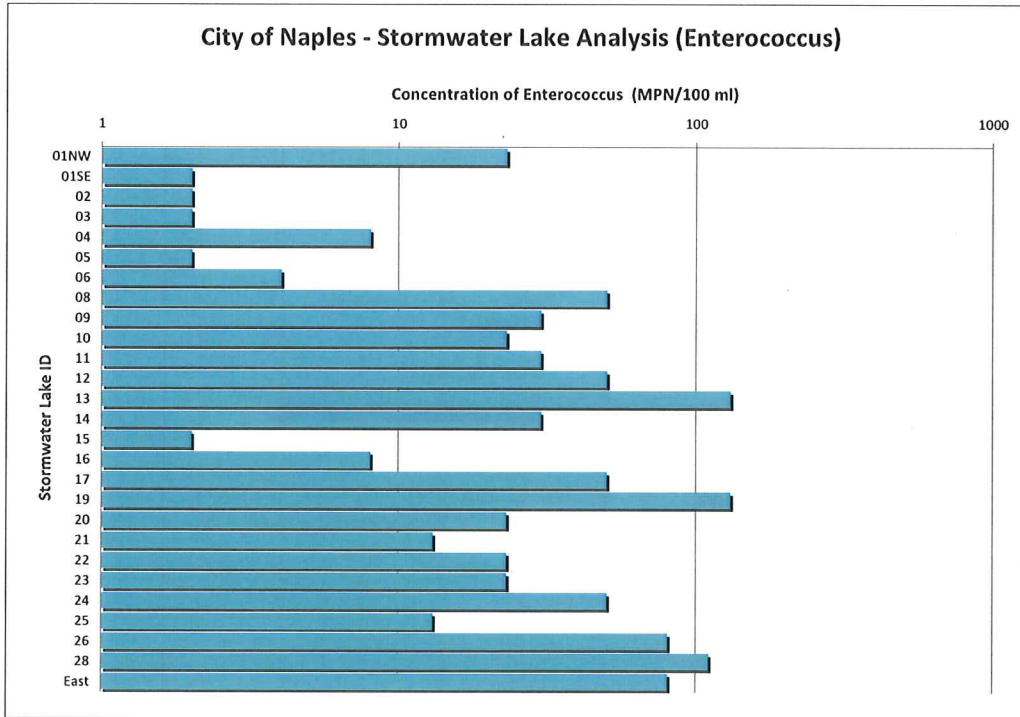
Prepared by: KKS Reviewed by: SEM

Figure 11. Fecal Coliform Concentrations in City of Naples Stormwater Lakes



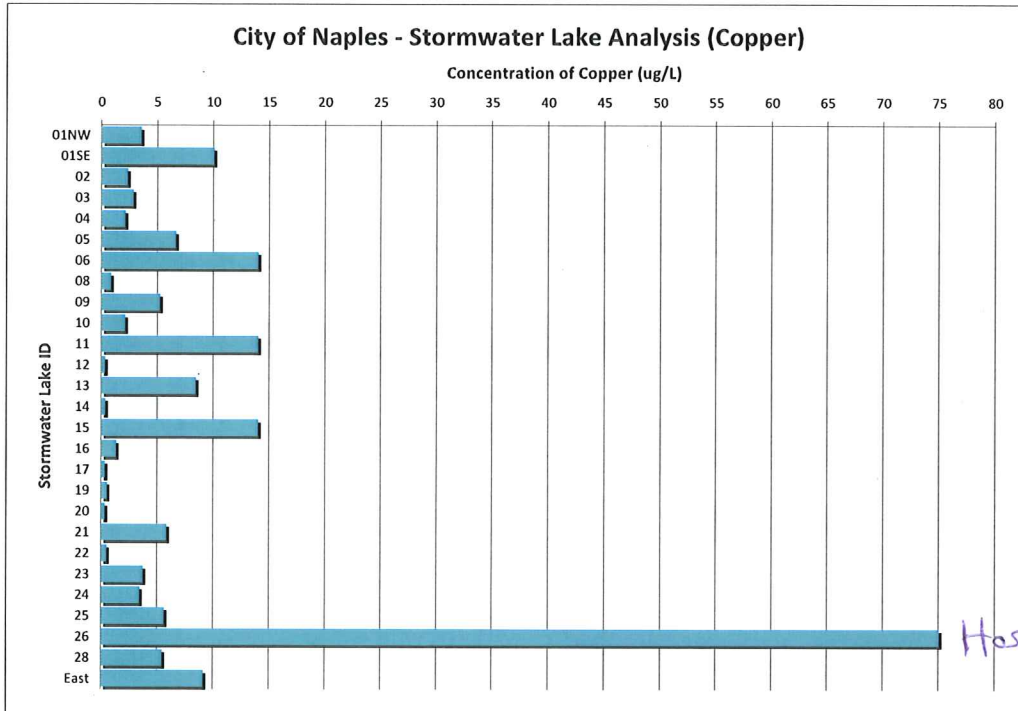
Prepared by: KKS Reviewed by: SEM

Figure 12. *Enterococcus* Concentrations in City of Naples Stormwater Lake



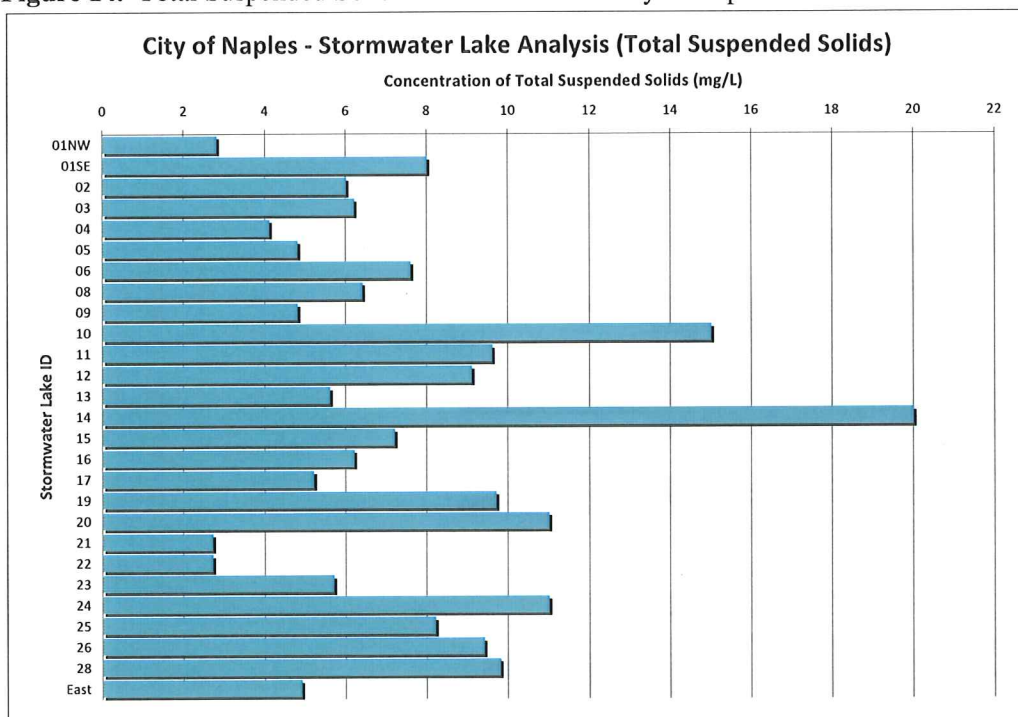
Detection Limit - 2 MPN/100ml
 Prepared by: KKS Reviewed by: SEM

Figure 13. Copper Concentrations in City of Naples Stormwater Lakes



Detection Limit - 0.3 ug/L
 Prepared by: KKS Reviewed by: SEM

Figure 14. Total Suspended Solid Concentrations in City of Naples Stormwater Lakes



Prepared by: KKS Reviewed by: SEM

Figure 15. Total Nitrogen (mg/L) Feb. and Sept. 2008; Aug. 2009 Select Stormwater Lakes

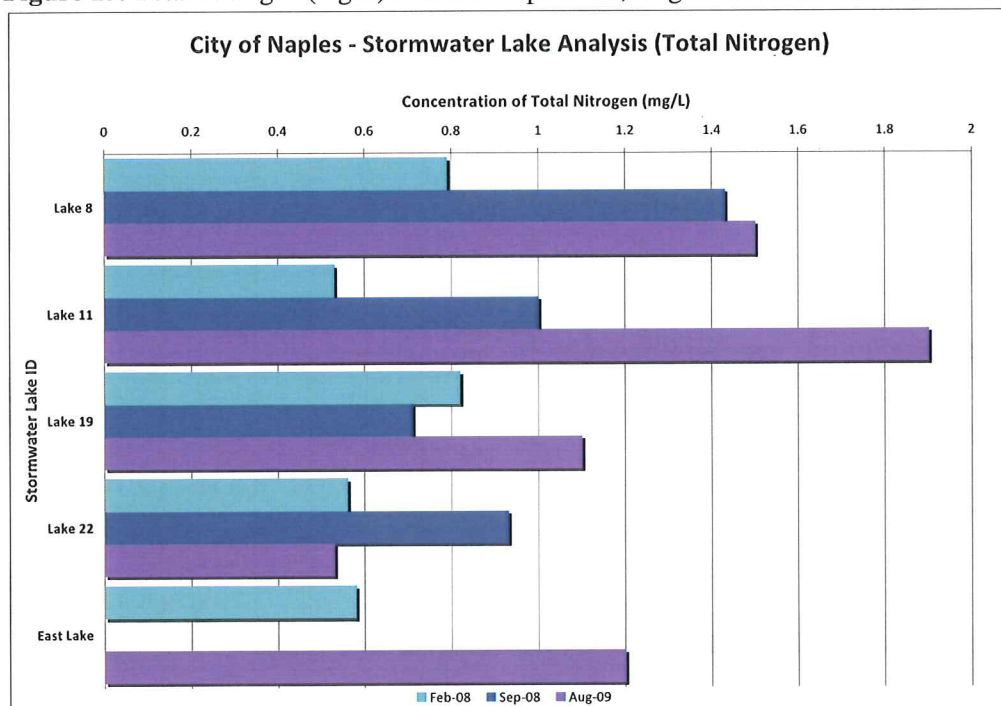


Figure 16. Total Phosphorus (mg/L) Feb. and Sept. 2008; Aug. 2009 Select Stormwater Lakes

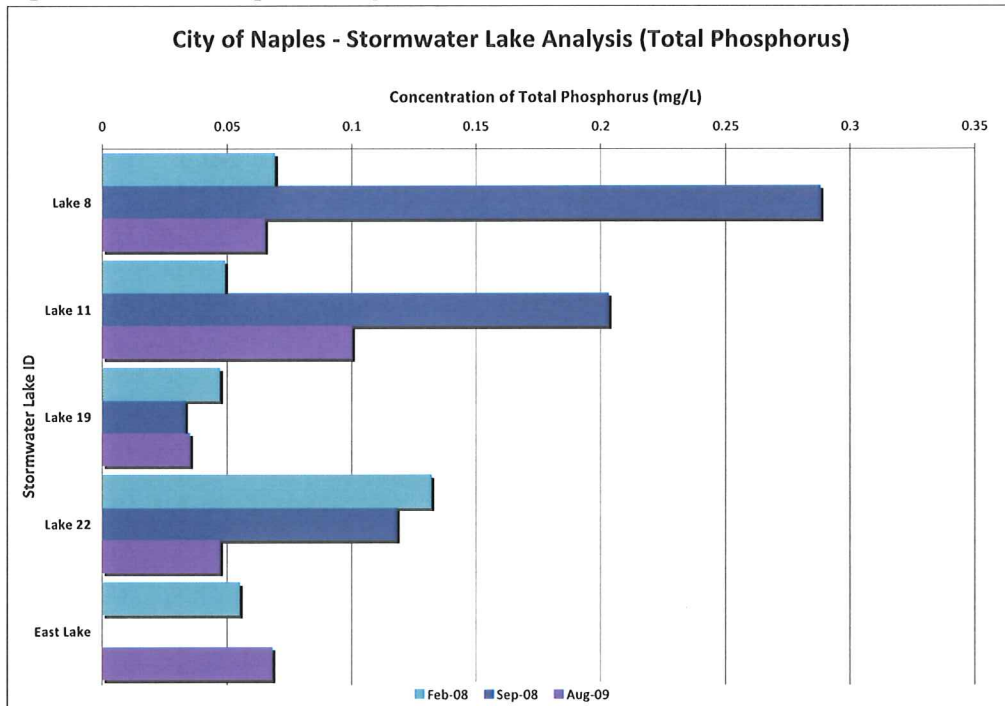


Figure 17. Copper (µg/L) Feb. and Sept. 2008; Aug. 2009 Select Stormwater Lakes

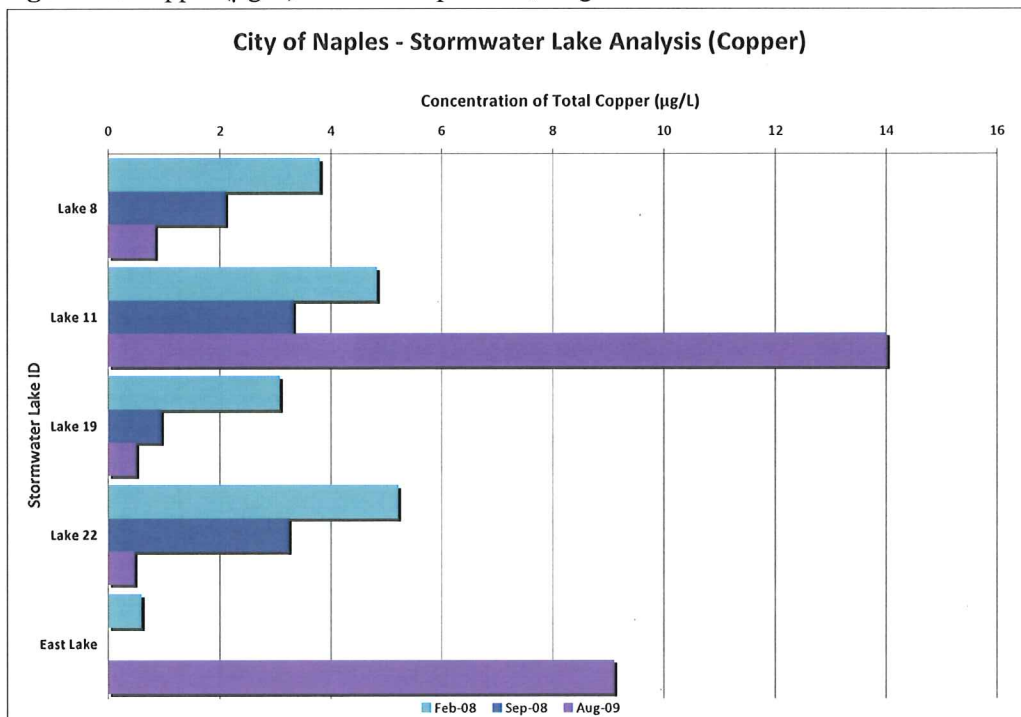


Figure 18. Fecal Coliform (CFU/100 ml) Feb. and Sept. 2008; Aug. 2009 Select Stormwater Lakes

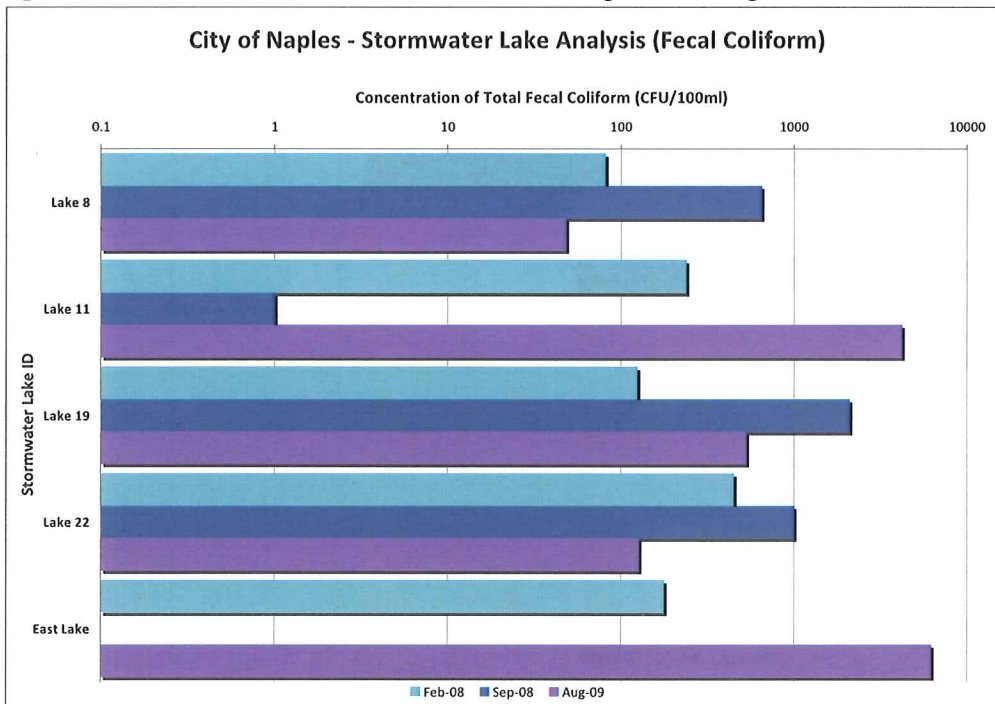


Figure 19. Enterococcus (MPN/100ml) Feb. and Sept. 2008; Aug. 2009 Select Stormwater Lakes

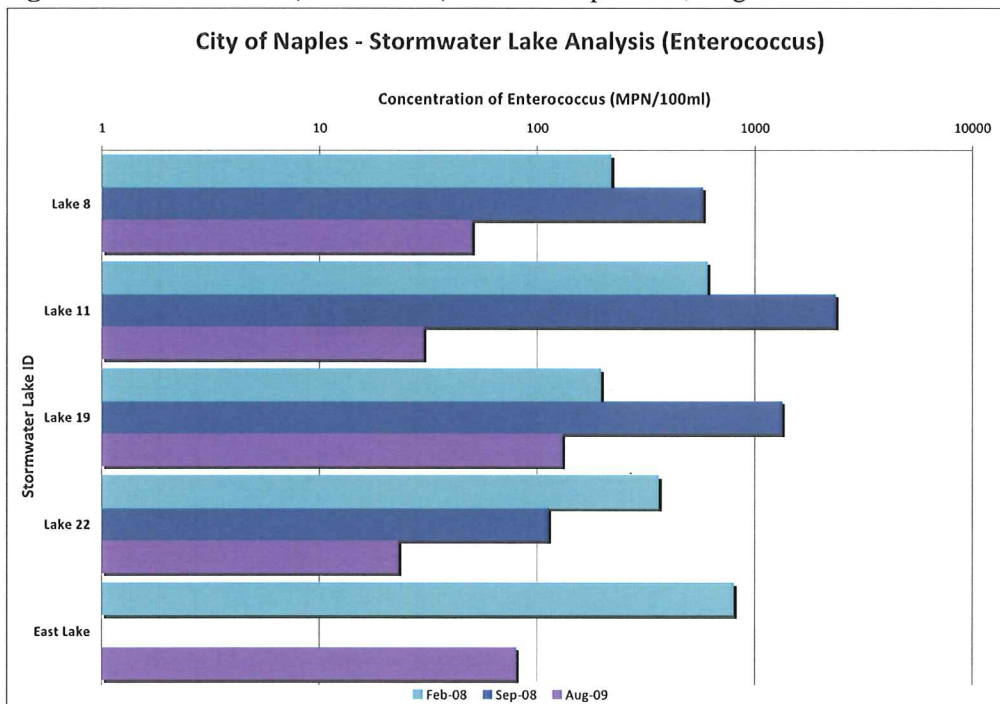


Figure 20. Nutrients Levels in Lake 14 January 2007 and August 2009

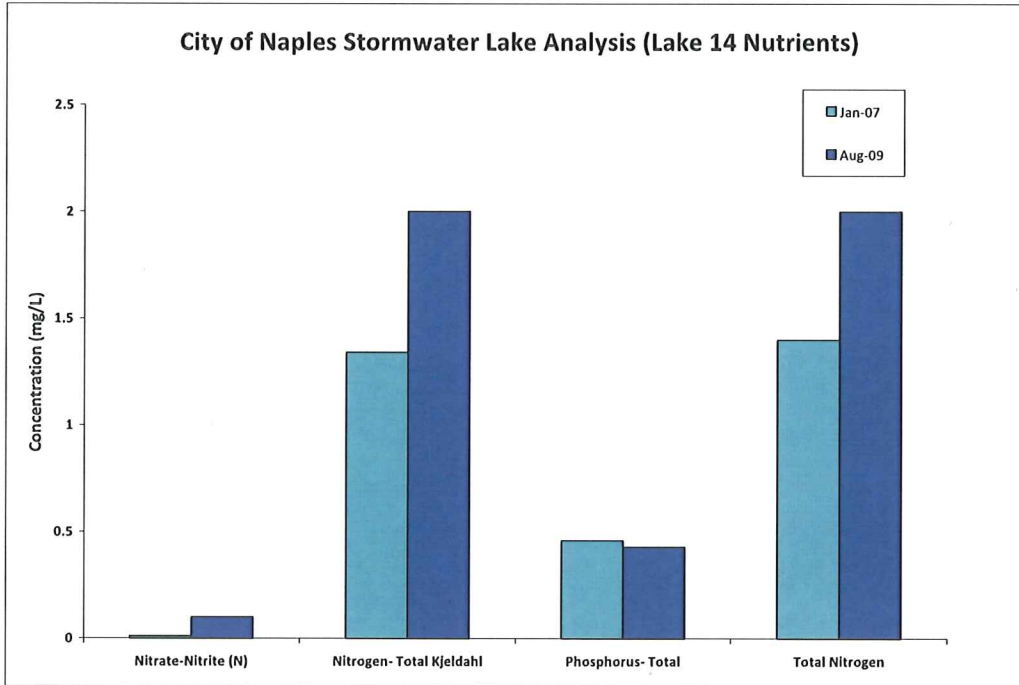
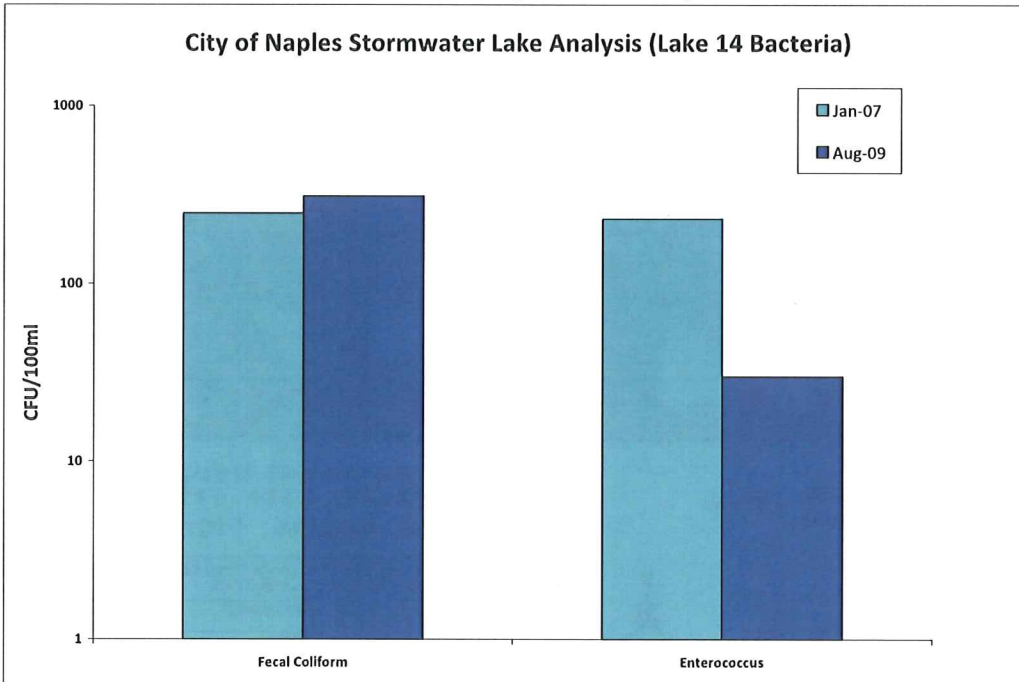
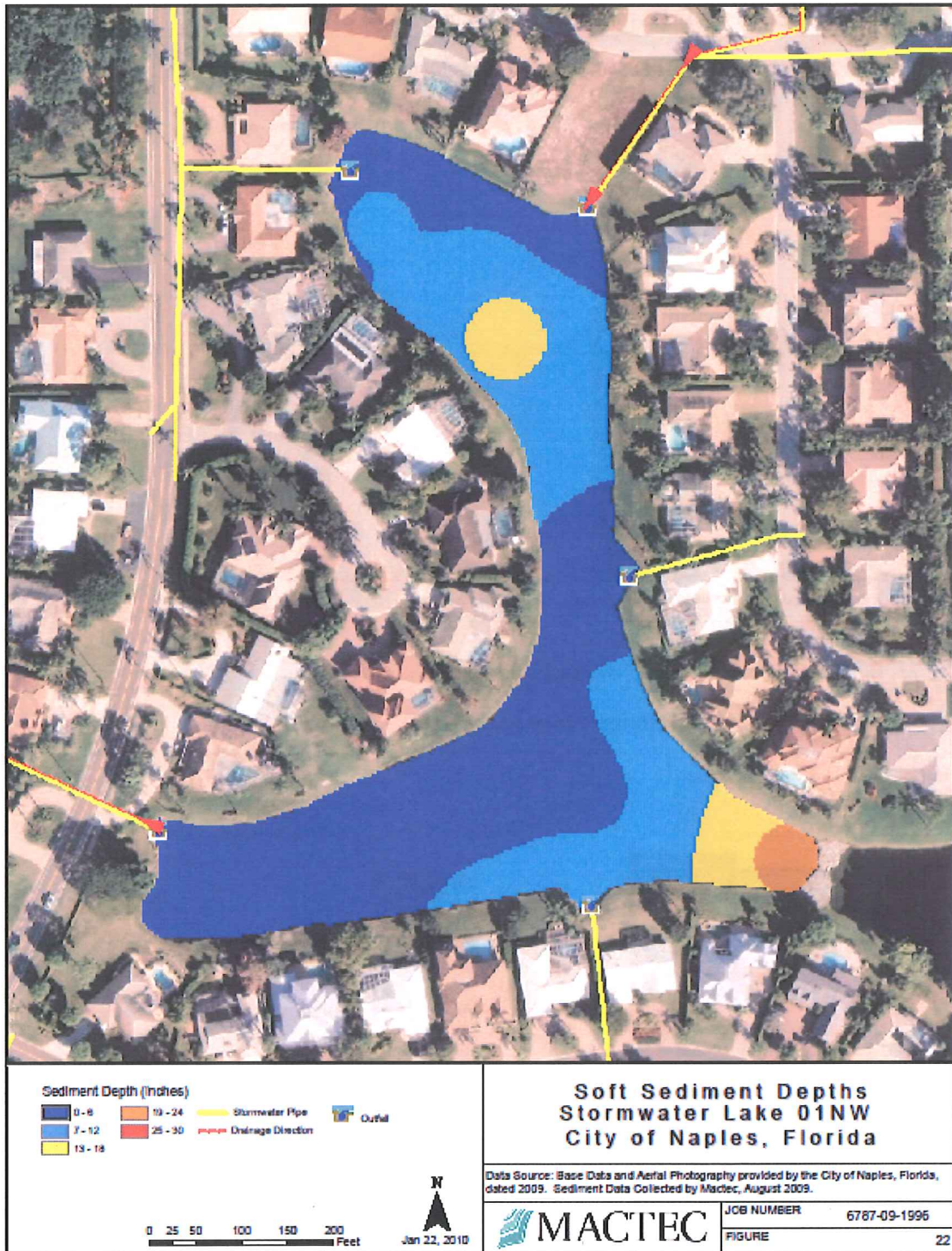
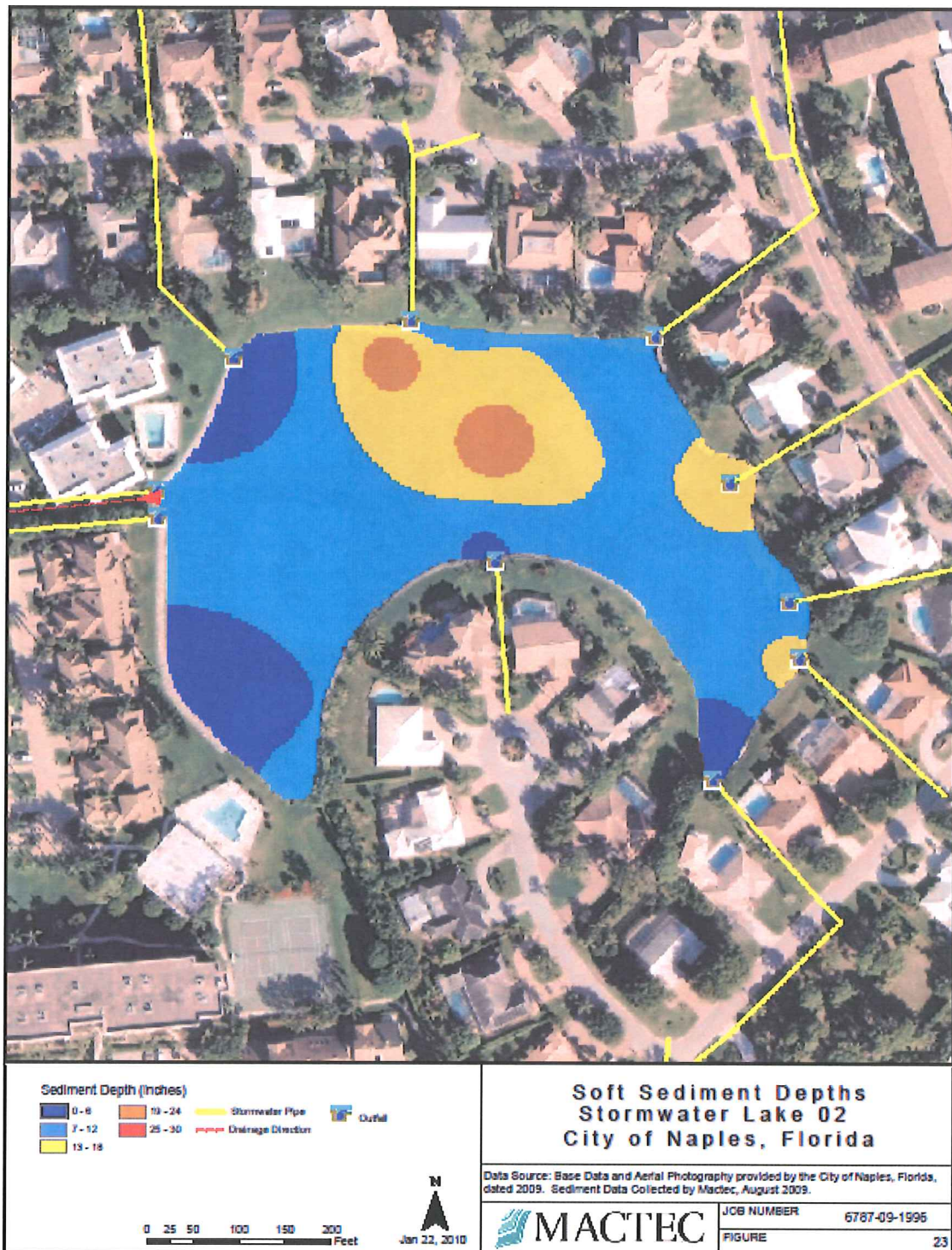
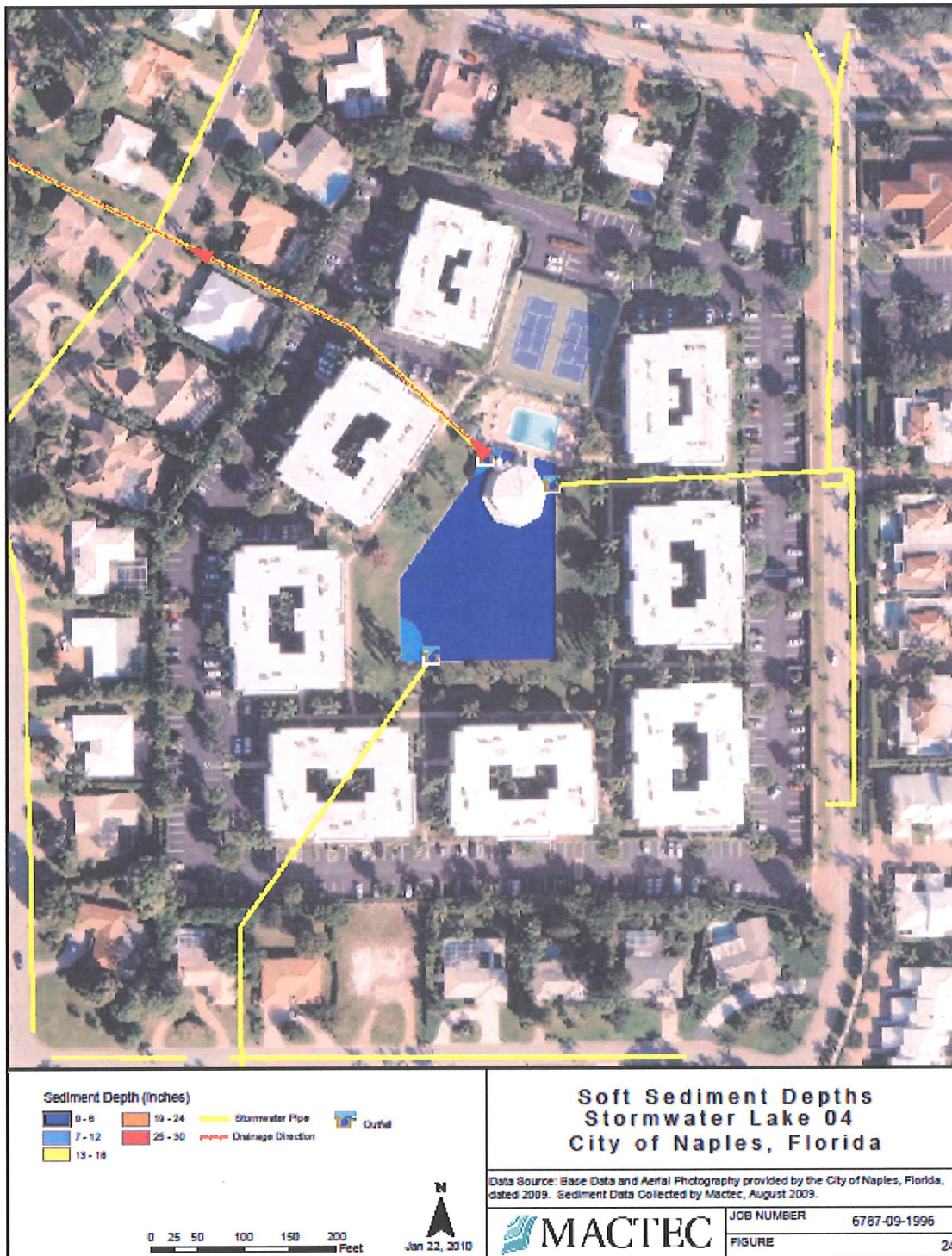


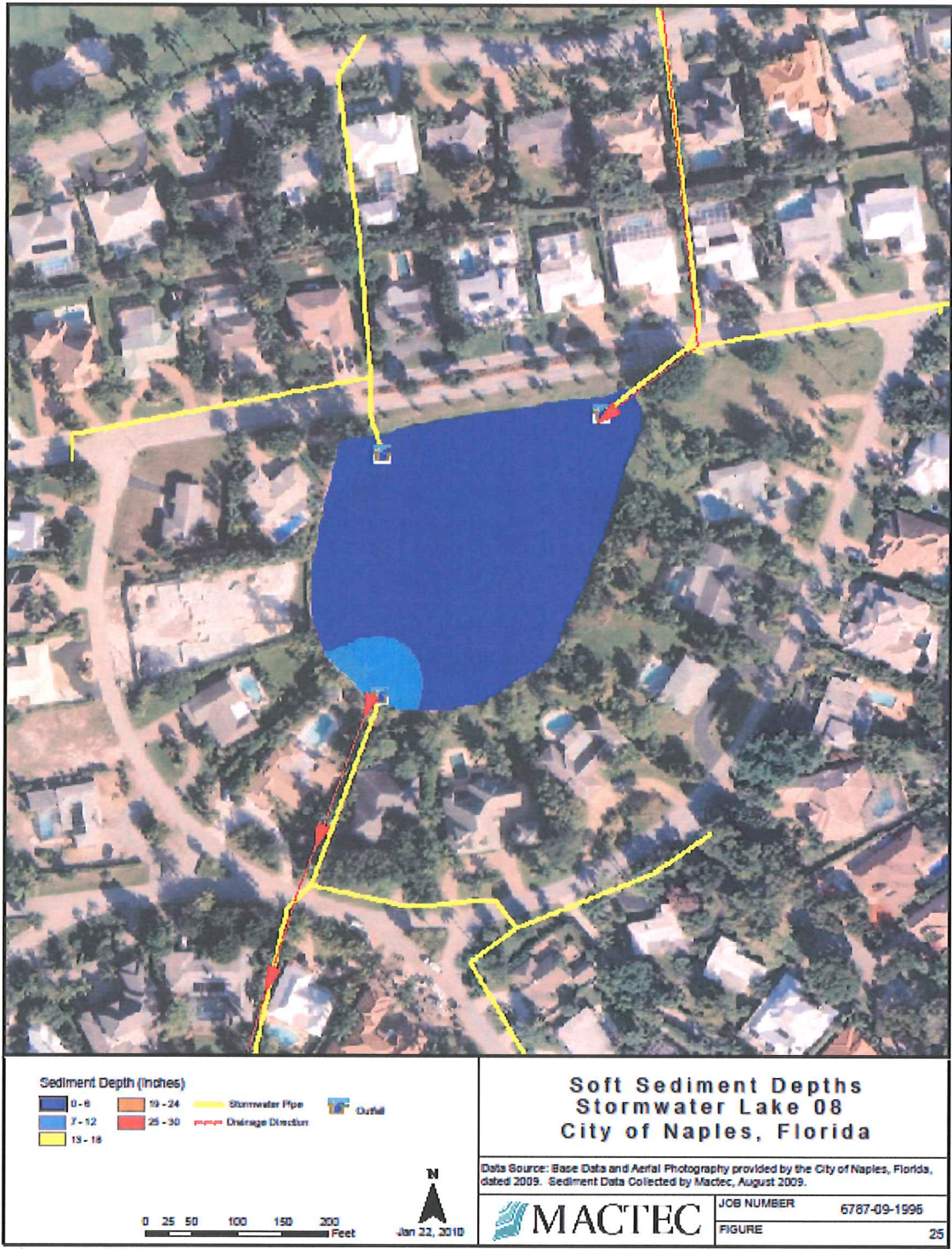
Figure 21. Bacteria Levels in Lake 14 January 2007 and August 2009

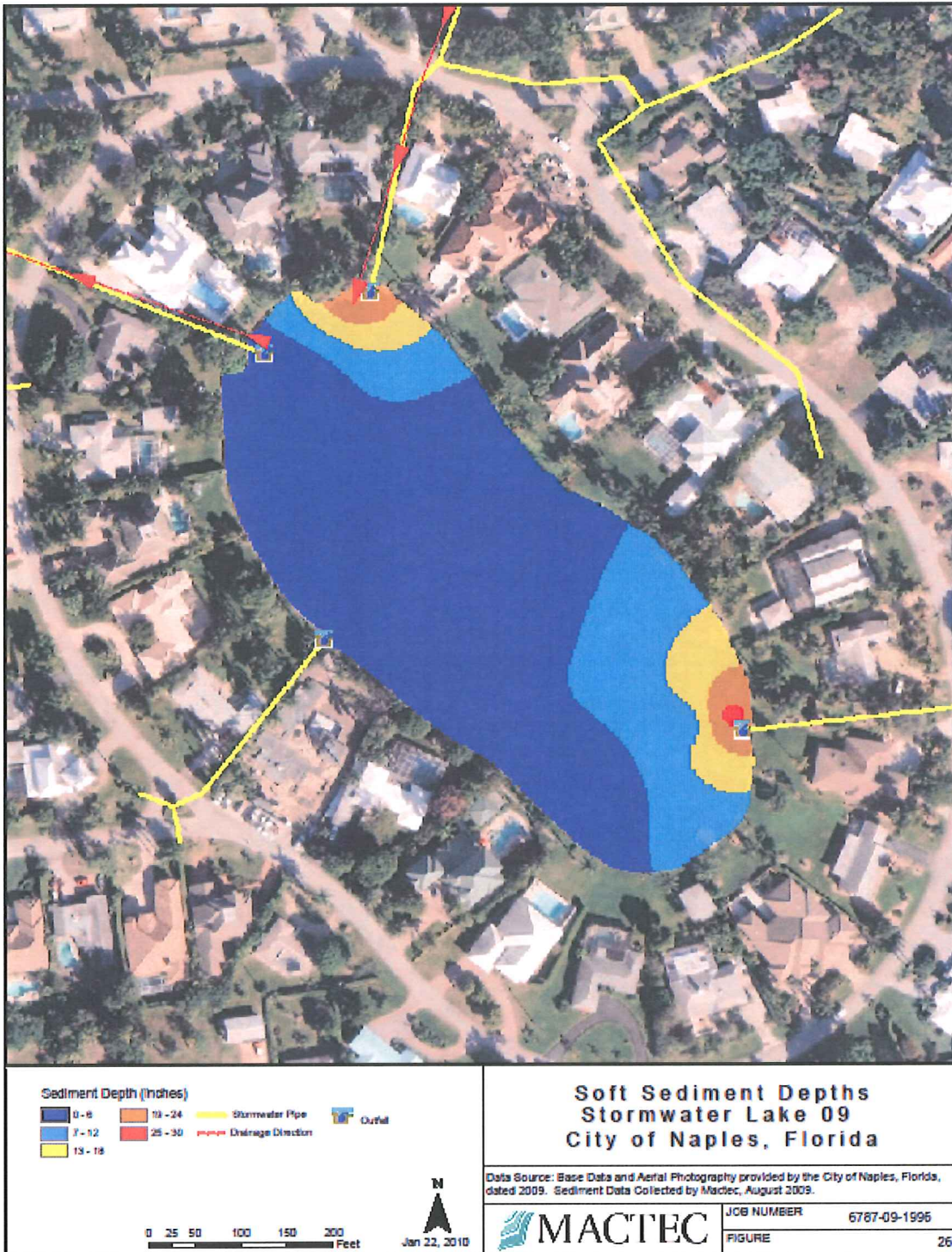


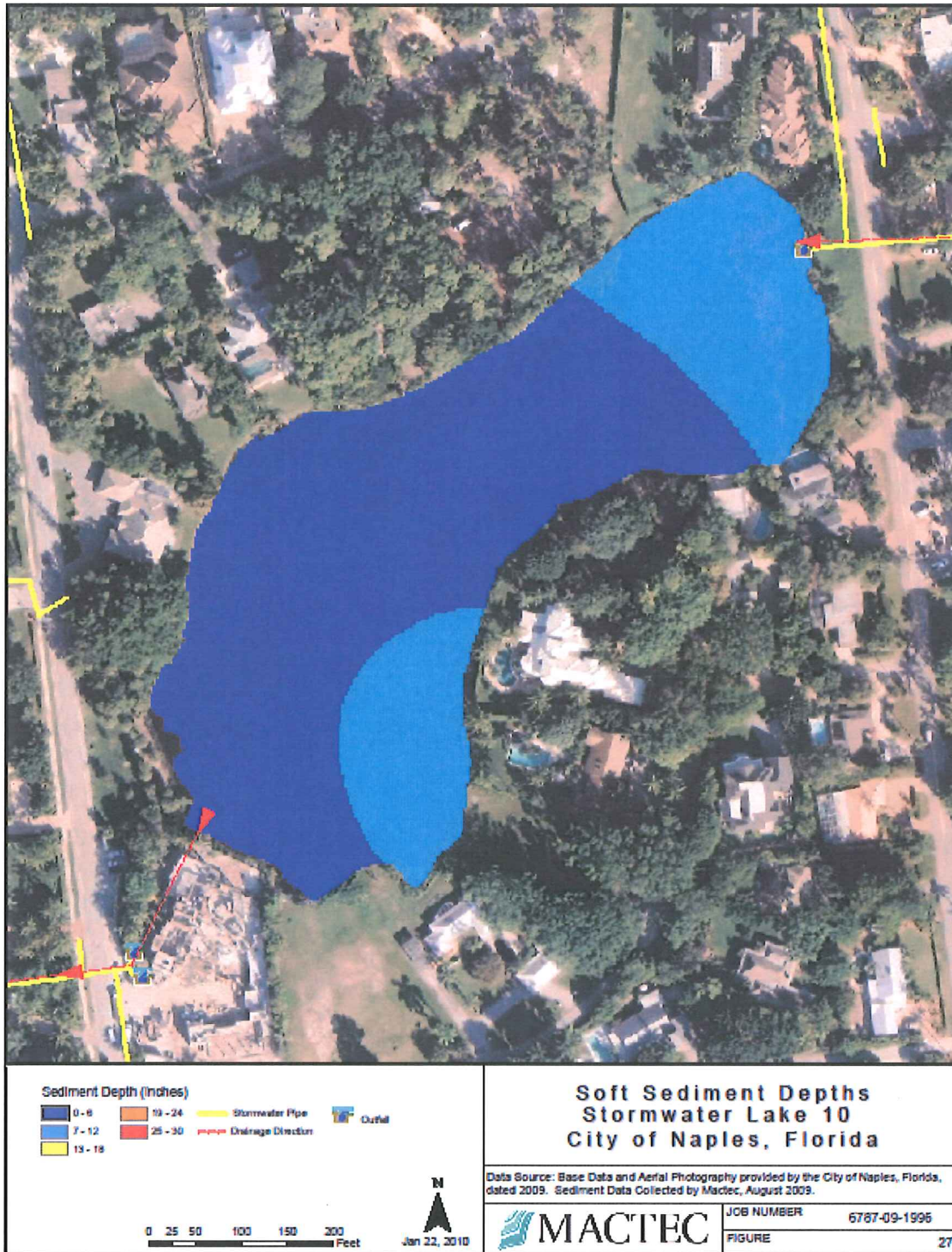


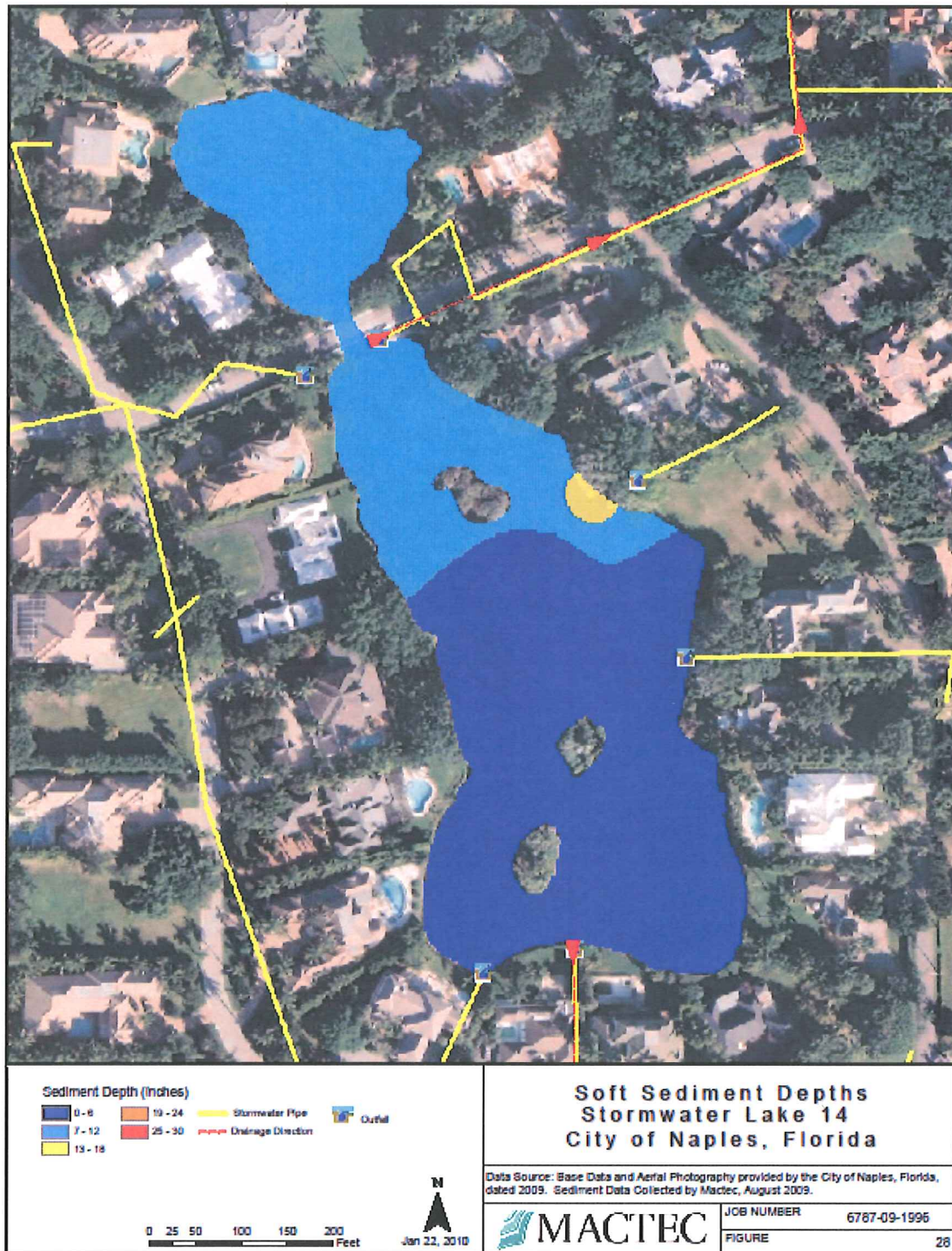


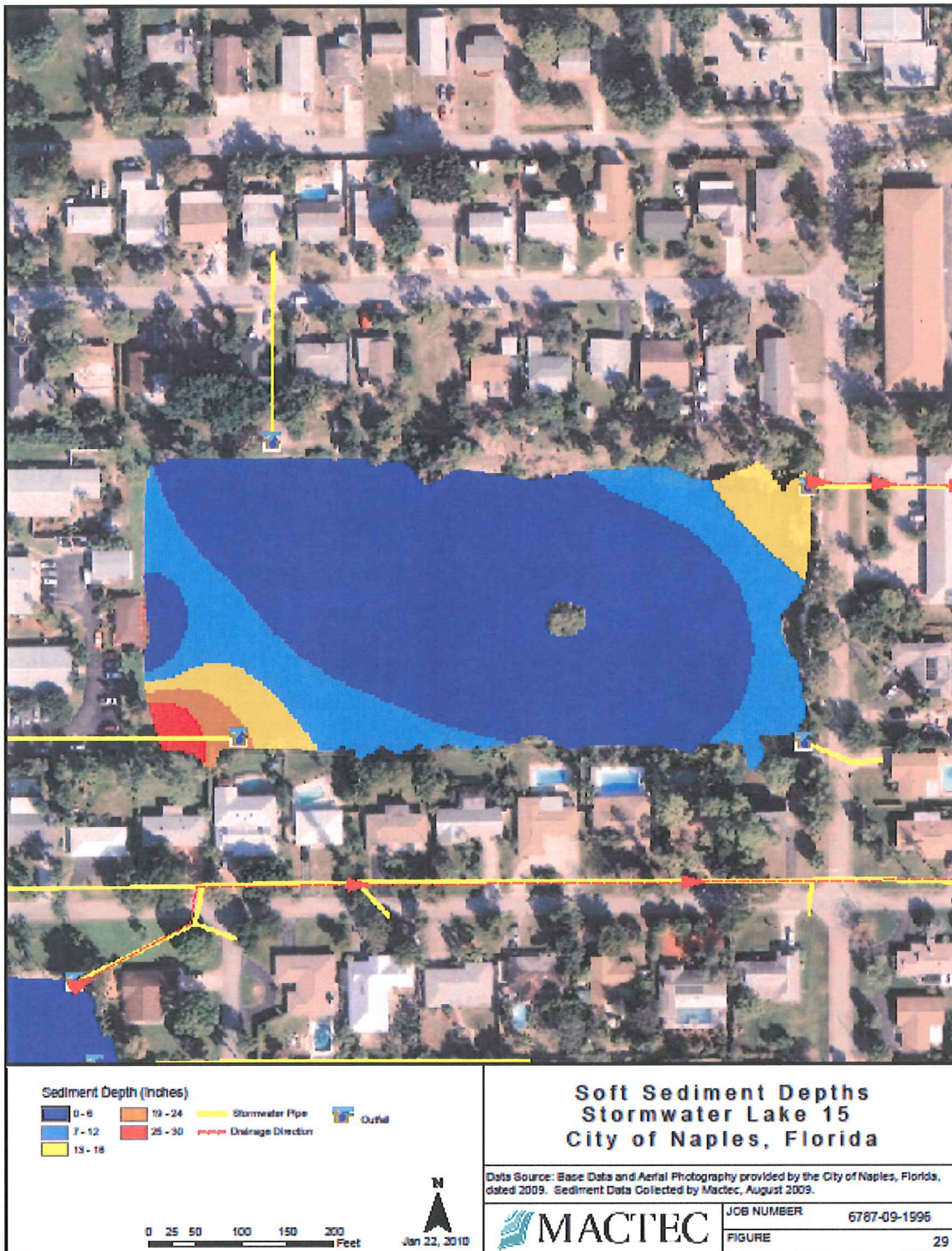




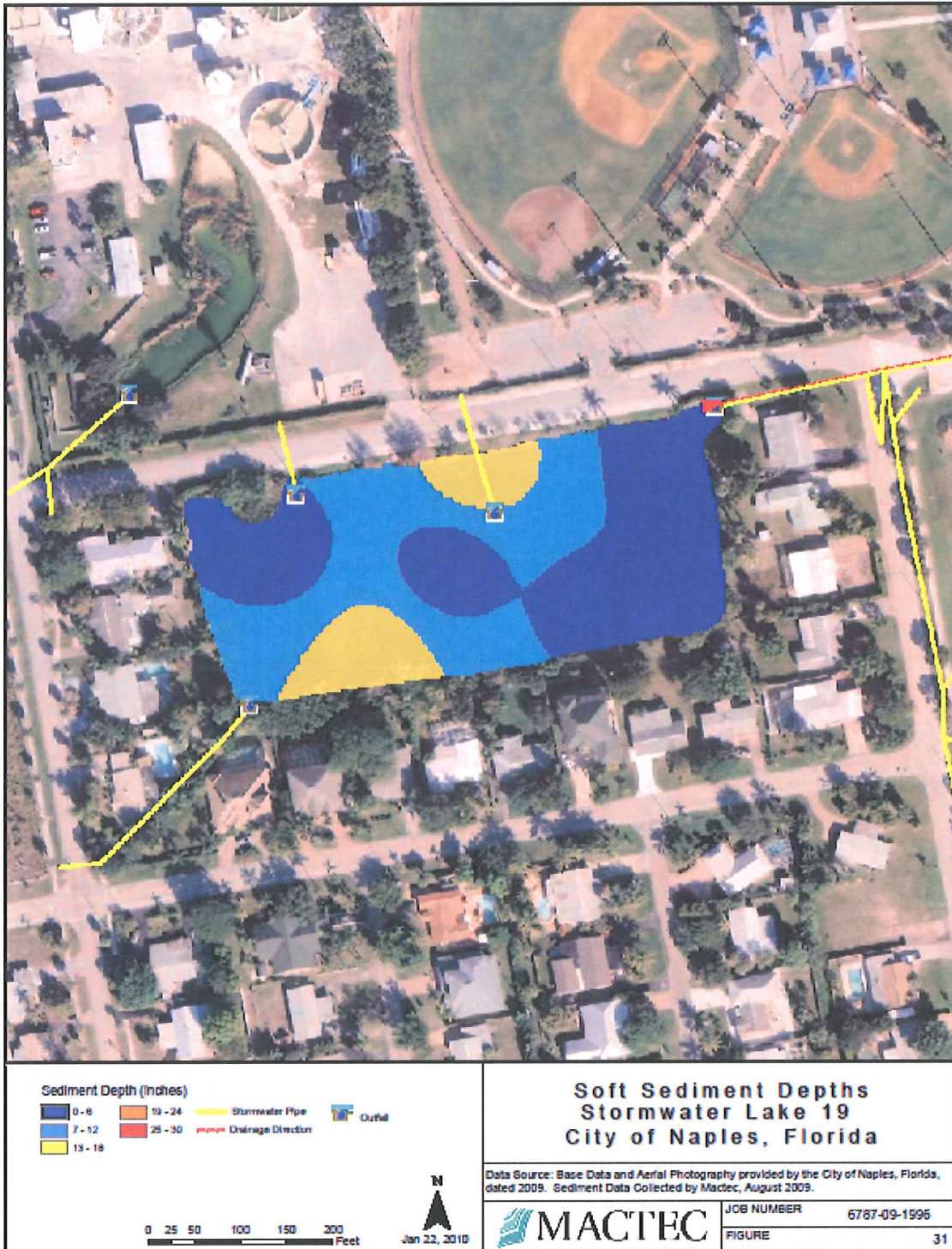


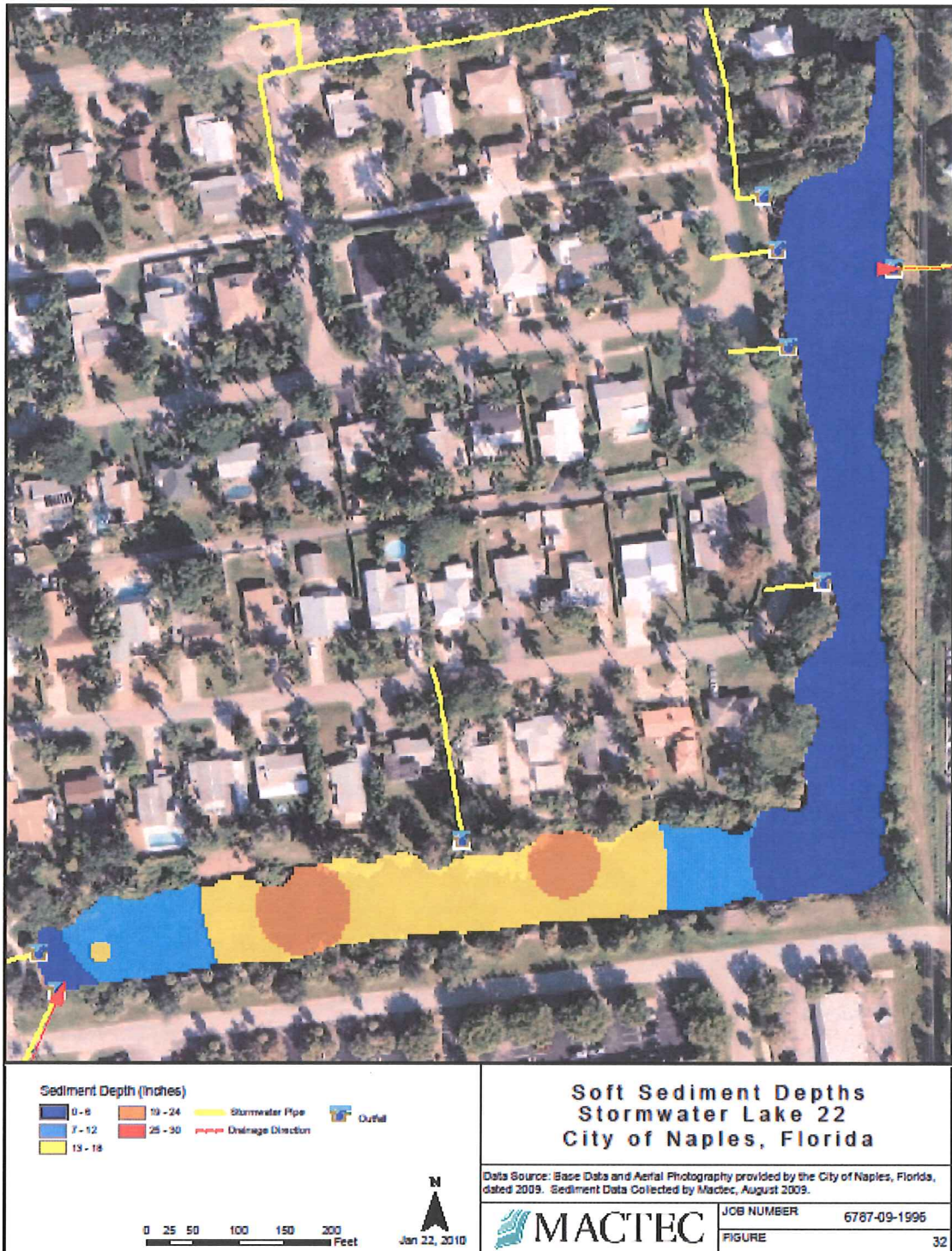














<p>Sediment Depth (Inches)</p> <p>0-6 13-24 Stormwater Pipe Outfall</p> <p>7-12 25-30 Drainage Direction</p> <p>13-18</p>		<p>Soft Sediment Depths Stormwater Lake 23 City of Naples, Florida</p> <p><small>Data Source: Base Data and Aerial Photography provided by the City of Naples, Florida, dated 2009. Sediment Data Collected by Mactec, August 2009.</small></p>	
<p>0 25 50 100 150 200 Feet</p> <p>Jan 22, 2010</p>			<p>JOB NUMBER 6787-09-1996</p> <p>FIGURE 33</p>

Tables
City of Naples Lake Maintenance and Improvement Program

Table 1. Surface Water Quality Measurements for City of Naples Stormwater Lakes

<i>Parameter</i>	Secchi Depth	Water Temperature	pH	Salinity	Conductivity	Dissolved Oxygen
<i>Units</i>	feet	°C	S.U.	ppt	µS/cm	ppm
<i>Stormwater Lake ID</i>						
01NW	3.5	31.1	7.1	0.2	373	7.7
01SE	3	31.4	7.3	0.2	387	6.1
02	2.3	30.1	6.9	0.1	268	6.1
03	2.5	30.86	7.41	0.26	615	8.9
04	3.5	30.56	6.68	0.2	435	5.35
05	3.5	32.71	6.92	0.14	344	4.96
06	2.5	30.01	7.31	0.2	517	5.32
07	NA	32.8	7.4	0.5	1150	6.2
08	2.3	31.1	7.6	7.8	32650	na
09	2.2	33.7	7.9	19	36087	7.3
10	2.7	34	7.5	26	48390	7.5
11	3.3	33	7.3	8.4	16930	9.5
12	NA	30.76	6.62	6.43	12664	0.68
13	NA	31.97	7.11	4	8328	2.2
14	1.5	31	7.4	Out of Range	Out of Range	2.5
15	3	33.3	7.8	0.2	437	10.3
16	2.5	31.8	7.71	0.2	474	7.18
17	NA	30.35	7.04	0.1	255	4.6
19	3	31.1	8.4	0.3	607	8.8
20	2	31.9	8.3	0.2	482	13.9
21	3	30.8	8	0.2	558	3.9
22	3.9	30.3	8.1	11	20860	8.1
23	4.3	31.7	7.3	13.75	25882	5.92
24	NA	31.5	7.3	0.3	738	3.4
25	2.75	30.91	6.94	0.3	772	7.03
26	2.4	30.64	6.72	0.17	402	4.54
28	2.5	28.83	6.58	0.4	927	2.2
East Lake	3.5	31.6	6.5	8	16665	3
Maximum	4.3	34	8.4	26	48390	13.9
Minimum	1.5	28.8	6.5	0.1	255	0.68
Average	2.9	31.4	7.3	4.02	8452	6.0

Prepared by: KKS Reviewed by: SEM

Table 2. Surface Water Chemistry Measurements for City of Naples Stormwater Lakes

Parameter	Nitrogen, Total	Nitrogen, Kjeldahl	Nitrate Nitrite as N	Total Phosphorus	Copper	Total Suspended Solids	Enterococcus	Fecal Coliform
Units	mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	MPN/100ml	CFU/100ml
Stormwater Lake ID								
01NW	1	1	0.1 U	0.024	3.5 V	2.8	23	145
01SE	1.2	1.2	0.1 U	0.047	10 V	8	2	100
02	1	1	0.1 U	0.095	2.3 I	6	2	2000
03	1.2	1.2	0.1 U	0.13	2.8 V	6.2	2	330
04	0.95	0.95	0.1 U	0.068	2.1 IV	4.1	8	21
05	1.5	1.4	0.1 U	0.061	6.6	4.8	2	530
06	1.4	1.4	0.1 U	0.03	14	7.6	4	4300
08	1.5	1.5	0.1 U	0.065	0.83 I	6.4	50	48
09	2.1	2	0.13 I	0.2	5.2	4.8	30	177
10	0.9	0.9	0.1 U	0.056	2.1 I	15	23	42
11	1.9	1.9	0.1 U	0.1	14	9.6	30	4200
12	1.7	1.7	0.1 U	0.025	0.3 U	9.1	50	490
13	1.7	1.7	0.1 U	0.056	8.4	5.6	130	3600
14	2	2	0.1 U	0.43	0.32 I	20	30	310
15	1.3	1.3	0.1 U	0.0092 I	14	7.2	2 U	250
16	1.3	1.3	0.1 U	0.036	1.3 IV	6.2	8	4000
17	1.3	1.3	0.1 U	0.09	0.3 U	5.2	50	520
19	1.1	1.1	0.1 U	0.035	0.49 I	9.7	130	530
20	1.7	1.7	0.1 U	0.072	0.3 U	11	23	2100
21	1.6	1.6	0.1 U	0.032	5.8	2.7	13	627
22	0.53	0.53	0.1 U	0.047	0.46 I	2.7	23	127
23	0.7	0.7	0.1 U	0.021	3.7	5.7	23	280
24	3.4	3.1	0.28 I	0.64	3.4	11	50	4800
25	1.8	1.4	0.38 I	0.069	5.6	8.2	13	2300
26	1	1	0.1 U	0.053	75	9.4	80	270
28	1.8	1.8	0.1 U	0.13	5.4	9.8	110	5300
East Lake	1.2	1.2	0.1 U	0.068	9.1	4.9	80	6200
Maximum	3.4	3.1	0.38 I	0.64	75	20	130	6200
Minimum	0.53	0.53	0.1 U	0.0092 I	0.3 U	2.7	2 U	21
Average	1.4	1.40	0.12	0.01	7.3	7.5	36.7	1614.7
Comparative Water Quality Criteria	1.3	1.31	na	0.0175	3.7 (marine)/ 8.95 (freshwater hardness 100mg/L)	20.0	104	400
Event Mean Concentration (EMC)	2.9	na	na	0.3	na	27.0	na	na

U- Indicates that the compound was analyzed for but not detected

V- Indicates the analyte was detected in both the sample and the associated blank

I- Indicates the reported value is between the laboratory method of detection limit and the laboratory practical quantitation limit

Rainfall Event

Table 3. Summary of Findings

Lake	Nutrients			Metals	Bacterial		Water Chemistry		Vegetation		Pond Maintenance		Owned by: City or Private
	TKN	TN	TP		Cu	Fecal Coliform	Enterococcus	Secchi Depth	DO	Structural	Shoreline		
01NW			x							x			Private
01SE			x	x									Private
2			x		x								City
3			x										Private
4			x										Private
5	x	x	x	x	x			x				x	Private
6	x	x	x	x	x					x			Private
7													Private
8	x	x	x										City
9	x	x	x								x		City
10			x								x		City
11	x	x	x	x	x					x			City
12	x	x	x		x			x		x			Private
13	x	x	x		x	x		x		x			Private
14	x	x	x					x					Private
15				x								x	Private
16			x		x							x	Private
17			x		x								Private
19			x		x	x							City
20	x	x	x		x	x							Private
21	x	x	x	x	x			x					City
22			x										City
23			x							x			City
24	x	x	x		x							x	Private
25	x	x	x	x	x								Private
26			x	x	x								Private
28	x	x	x	x	x	x						x	Private
East Lake			x	x	x					x			City

"x" indicated levels exceed recommended water quality criteria values or values listed below and/or maintenance issues were identified
 Secchi depth < 2 ft
 DO < 5 ppm

Table 4. Soft Sediment Thickness

Lake ID	Water Depth at Maximum Soft Sediment Measurement (inches)	Maximum Soft Sediment Thickness Measured (inches)
01NW	67	19
01SE	31	14
2	80	22
3	60	1
4	42	7
5	54	14
6	60	17
7	36	1
8	56	8
9	40	25
10	127	11
11	54	9
12	27	5
13	25	4
14	74	14
15	51	17
16	81	4
17	17	0
19	123	18
20	114	30
21	88	2
22	111	21
23	42	1
24	18	15
25	84	24
26	26	1
28	75	18
East Lake	104	15

Prepared by: SEM Reviewed by: RDD

Table 5. Stormwater Lake Maintenance Tasks and Frequencies

Task	Frequency	Notes
Perform Lake/Infrastructure Inspection	Annually	Inspection will identify maintenance requirements
Monitor Water Chemistry (TP, TN, DO, CU, TSS, Microbial)	Every 3 years, except for prioritized lakes	Monitoring will identify causes of aesthetic concern- i.e. high nutrient levels can cause excessive aquatic plant and algal growth
Monitor soft sediment depth	Every 5 years, or if indicated	Monitoring soft sediment depth will help identify when dredging is needed
Remove invasive vegetation	One to two times per year (as needed)	South Florida is a haven for invasive aquatic plants. The high nutrients in many of these lakes leave them vulnerable to aquatic invasives. Mechanical removal is the best management practice.
Remove sediment (as needed)	Only as indicated	Sediment accumulation varies between lakes. Soft sediment monitoring will help determine need. As sediment accumulates lake flood control and treatment capacities can be reduced

