



**PROFESSIONAL SERVICES**

TRANSPORTATION • MUNICIPAL  
DEVELOPMENT • ENVIRONMENTAL

# MEMO

---

**To:** City of Middleton  
**From:** Ann Dansart, P.H., Eric Thompson, P.E.  
**Subject:** Storm Water Quality Plan Addendum  
**Date:** June 5, 2009

---

This memo is an addendum to the September 19, 2007 Stormwater Quality Plan prepared by MSA Professional Services, Inc. for the City of Middleton, WI. The purpose of this memo is to document the results of updated WinDETPOND and P8 modeling of various City ponds that has occurred since the September 19, 2007 Storm Water Quality report was published. Specifically, the pollutant trapping efficiency of individual ponds has been updated, and the impact of these individual ponds' changed pollutant trapping efficiency on the City's overall municipal regulated TSS load reduction has been tabulated.

The main differences between the 2007 and 2009 modeling include the following:

- 1) Minor revisions have been made to a number of ponds, in response to updated modeling guidance from the WDNR, and in order to correct a few modeling (data entry) errors that were discovered since 2007; and
- 2) The confluence pond model was modeled in P8 and calibrated to match streamflow gauge data at Parmenter street (just downstream of this pond) and hydraulically modeled backwater effects on the pond outlet structure predicted by XP-SWMM and HEC-RAS modeling of the pond and the downstream reach of Pheasant Branch creek.

Table 1 below, summarizes the results of the revised modeling on the overall municipal regulated TSS load reduction. The first column of results in Table 1 shows the citywide TSS reduction reported in September 2007. The second column shows the overall change from revising pond models other than the confluence pond in WinDETPOND (scenario 1 above). The third column shows the results of the revised WinDETEPOND models *and* the calibrated confluence pond model (scenarios 1 and 2 above).

---

**Offices in Illinois, Iowa, Minnesota, and Wisconsin**

2901 International Lane, Suite 300, Madison, WI 53704-3133  
(608) 242-7779 (800) 446-0679  
FAX: (608) 242-5664 WEB ADDRESS: [www.msa-ps.com](http://www.msa-ps.com)

**Table 1.** City of Middleton, WI: Existing TSS Reduction, Municipal Regulated Load

	<b>September 2007 Report</b>	<b>June 2009 Addendum</b>	
		WinDETPOND Model Revised (Sc. 1)	WinDETPOND Model Revised + P8 Calibrated Confluence Pond Model (Sc. 1& 2)
No Controls Annual Regulated Load	611.7 tons/yr	611.7 tons/yr	611.7 tons/yr
TSS Removed by Street Sweeping	15.3 tons/yr	15.3 tons/yr	15.3 tons/yr
Additional TSS Removed by Structural BMPs	202.0 tons/yr	184.4.3 tons/yr	237. 3 tons/yr
Total TSS Removed	217.3 tons/yr	199.4 tons/yr	252.6 tons/yr
<b>TSS Reduction Rate</b>	<b>35.5%</b>	<b>32.6%</b>	<b>41.3%</b>

With both the WinDETPOND and P8 modeling revisions, the City's overall existing load reduction has increased from 35.5% to 41.3%. The City therefore meets the WNDL requirement to reduce TSS in runoff from existing developed areas, by 40% by 2013.

Tables 2 and 3, attached, show the TSS reduction achieved by each existing City pond with and without the modified confluence pond, respectively. Note in Tables 2 and 3, that because SLAMM and WinDETPOND are not able to model ponds in series, the cumulative effectiveness of the BMPs is determined algebraically by applying the highest efficiency of any downstream BMP in series with the BMP being considered. This is due to WinSLAMM's inability to track the particle distribution (and hydrograph attenuation) being discharged from any single BMP. This approach and its limitations is described and discussed at length in Section 5.4 of the 2007 report.

**Offices in Illinois, Iowa, Minnesota, and Wisconsin**

---

2901 International Lane, Suite 300, Madison, WI 53704-3133  
(608) 242-7779 (800) 446-0679  
FAX: (608) 242-5664 WEB ADDRESS: [www.msa-ps.com](http://www.msa-ps.com)

**Table 2. Individual Pond Pollutant Trapping Efficiencies - WinDETPOND Modeling Only**

Discharge Location	Discharge Location (or BMP) Name	Direct TSS Load* (lbs/yr)	BMP Efficiency**	Street Sweeping Area	Sweeping Efficiency	Downstream BMPs (Enter # of downstream BMP)				Max Downstream TSS Efficiency	TSS Load Attenuated
1	1.01	264,326	50.1%	1	0.025					50.1%	132,427
2	1.02	2,065	18.3%	1	0.025	1				50.1%	1,035
3	1.03	48,343	14.9%	1	0.025	1				50.1%	24,220
4	1.04	1,446	20.3%	1	0.025	1				50.1%	724
5	2.0102	60,200	73.0%	1	0.025	1				73.0%	43,946
6	4.01	14,064	58.9%	1	0.025					58.9%	8,284
7	5.01	2,937	82.0%	1	0.025					82.0%	2,408
8	6.01	3,179	99.5%	1	0.025					99.5%	3,163
9	7.01	913	9.5%	1	0.025	1				50.1%	457
10	7.020304	862	32.4%	1	0.025	1				50.1%	432
11	9.01	2,282	24.0%	1	0.025	1	12			50.1%	1,143
12	9.02	1,267	31.4%	1	0.025	1				50.1%	635
13	9.03	1,974	7.2%	1	0.025	1				50.1%	989
14	11.01	884	50.2%	1	0.025					50.2%	444
15	12.01	690	45.2%	1	0.025	16				45.2%	312
16	12.02	137	16.7%	1	0.025					16.7%	23
17	13.01	86	31.4%	1	0.025	18	20	21		59.0%	51
18	13.02	0	8.2%	1	0.025	20	21			59.0%	0
19	15.01	18,781	26.3%	1	0.025					26.3%	4,939
20	16.01	7,162	59.0%	1	0.025	21				59.0%	4,226
21	16.02	2,885	0.1%	1	0.025					2.5%	72
22	17.01	3,040	64.3%	1	0.025	23	24			81.6%	2,481
23	17.02	460	81.6%	1	0.025	24				81.6%	375
24	17.03	1,408	54.6%	1	0.025					54.6%	769
25	18.01	4,012	38.4%	1	0.025	1				50.1%	2,010
26	18.02	776	24.7%	1	0.025	1				50.1%	389
27	18.03	14,968	20.3%	1	0.025	1				50.1%	7,499
28	18.04	1,895	36.1%	1	0.025	1	27			50.1%	949
29	18.05	2,546	32.8%	1	0.025	1	3			50.1%	1,276
30	20.01	6,381	33.7%	1	0.025	21				33.7%	2,150
31	21.01	13,949	10.0%	1	0.025					10.0%	1,395
32	23.01	2,626	66.2%	1	0.025	1	5			73.0%	1,917
33	23.02	3,094	40.3%	1	0.025	1	5			73.0%	2,259
34	24.01	4,475	48.3%	1	0.025					48.3%	2,161
35	25.01040512	5,019	38.5%	1	0.025	61				38.5%	1,932
36	25.0203	1,673	9.5%	1	0.025	1	5			73.0%	1,221
37	25.06	1,014	2.2%	1	0.025	61				35.2%	357
38	25.0711	4,665	2.2%	1	0.025	63				17.0%	793
39	26.01	4,806	67.1%	1	0.025					67.1%	3,225
40	26.02	3,124	90.0%	1	0.025					90.0%	2,812
41	27.01	13,914	72.2%	1	0.025					72.2%	10,046
42	28.01	32,111	74.0%	1	0.025					74.0%	23,762
43	28.02	455	63.7%	1	0.025	42				74.0%	337
44	29.01	177	93.1%	1	0.025	1	3			93.1%	165
45	29.02	29	100.0%	1	0.025	1	3			100.0%	29
46	31.01	29,740	57.9%	1	0.025					57.9%	17,219
47	33.01	52	83.9%	1	0.025	1				83.9%	44
48	33.02	103	89.9%	1	0.025	1				89.9%	93
49	34.01	355	0.2%	1	0.025	61				35.2%	125
50	35.01	164	54.7%	1	0.025	46				57.9%	95
51	36.01	2,002	63.0%	1	0.025					63.0%	1,261
52	39.01	460	80.0%	1	0.025	1				80.0%	368
53	40.01	400	67.0%	1	0.025	31				67.0%	268
54	41.01	960	15.3%	1	0.025	61				35.2%	338
55	42.01	9,908	71.7%	1	0.025					71.7%	7,104
56	42.02	956	80.2%	1	0.025					80.2%	767
57	43.01	1,568	30.3%	1	0.025	46				57.9%	908
58	44.01	23,833	24.6%	1	0.025	1	3			50.1%	11,940
59	45.01	8,720	27.0%	1	0.025					27.0%	2,354
60	46.01	11,673	57.8%	1	0.025					57.8%	6,747
61	47.01	19,632	35.2%	1	0.025					35.2%	6,910
62	47.02	965	25.9%	1	0.025					25.9%	250
63	47.03	558	17.0%	1	0.025					17.0%	95
64	48.01	1,115	81.2%	1	0.025	19				81.2%	905
65	49.01	9,113	26.6%	1	0.025					26.6%	2,424
66	50.01	1,187	87.1%	1	0.025	1				87.1%	1,034
67	51.01	626	13.8%	1	0.025	1	5	71	72	73.0%	457
68	51.02	1,900	47.6%	1	0.025	1	5	72		73.0%	1,387
69	51.03	1,166	44.2%	1	0.025	1	5			73.0%	851
70	51.04	1,718	30.0%	1	0.025	1	5	72		73.0%	1,254
71	51.05	12,325	17.6%	1	0.025	1	5	72		73.0%	8,997
72	51.06	586	9.7%	1	0.025	1	5			73.0%	428
73	51.07	1,244	18.2%	1	0.025	1	5			73.0%	908
74	52.01	3,454	41.9%	1	0.025					41.9%	1,447
75	52.02	15,086	35.3%	1	0.025	74				41.9%	6,321
76	53.01	725	63.1%	1	0.025	77				63.1%	457
77	53.02	673	55.2%	1	0.025					55.2%	371
78	55.01	192	26.3%	1	0.025					26.3%	50
79	57.01	1,183	57.5%	1	0.025	1				57.5%	680
80	58.01	651	40.9%	1	0.025	31				40.9%	266
81	59.01	1,063	11.1%	1	0.025	1				50.1%	533
82	61.01	558	29.6%	1	0.025	1				50.1%	280
83	61.02	406	23.9%	1	0.025	1				50.1%	203
84	Direct	495,200	0.0%	1	0.025					2.5%	12,380
<b>TOTAL</b>		<b>1,223,320</b>	<b>32.6%</b>								<b>398,760</b>

\*Include only TSS generated in the watershed that drains directly to the BMP. Do not include any TSS that first drains to an upstream BMP.

\*\*TSS attenuation rate of BMP. Enter "0" if no BMP.

\*\*\*Enter 1 if located in street sweeping area 1, 2 if in area 2, or 0 if the area is not swept

**Table 3. Individual Pond Pollutant Trapping Efficiencies with Confluence Pond Model Calibrated in P8**

Discharge Location	Discharge Location (or BMP) Name	Direct TSS Load* (lbs/yr)	BMP Efficiency**	Street Sweeping Area	Sweeping Efficiency	Downstream BMPs (Enter # of downstream BMP)				Max Downstream TSS Efficiency	TSS Load Attenuated
1	1.01	264,326	77.5%	1	2.5%					77.5%	204,853
2	1.02	2,065	18.3%	1	2.5%	1				77.5%	1,600
3	1.03	48,343	14.9%	1	2.5%	1				77.5%	37,466
4	1.04	1,446	20.3%	1	2.5%	1				77.5%	1,121
5	2.0102	60,200	73.0%	1	2.5%	1				77.5%	46,655
6	4.01	14,064	58.9%	1	2.5%					58.9%	8,284
7	5.01	2,937	82.0%	1	2.5%					82.0%	2,408
8	6.01	3,179	99.5%	1	2.5%					99.5%	3,163
9	7.01	913	9.5%	1	2.5%	1				77.5%	708
10	7.020304	862	32.4%	1	2.5%	1				77.5%	668
11	9.01	2,282	24.0%	1	2.5%	1	12			77.5%	1,769
12	9.02	1,267	31.4%	1	2.5%	1				77.5%	982
13	9.03	1,974	7.2%	1	2.5%	1				77.5%	1,530
14	11.01	884	50.2%	1	2.5%					50.2%	444
15	12.01	690	45.2%	1	2.5%	16				45.2%	312
16	12.02	137	16.7%	1	2.5%					16.7%	23
17	13.01	86	31.4%	1	2.5%	18	20	21		59.0%	51
18	13.02	0	8.2%	1	2.5%	20	21			59.0%	0
19	15.01	18,781	26.3%	1	2.5%					26.3%	4,939
20	16.01	7,162	59.0%	1	2.5%	21				59.0%	4,226
21	16.02	2,885	0.1%	1	2.5%					2.5%	72
22	17.01	3,040	64.3%	1	2.5%	23	24			81.6%	2,481
23	17.02	460	81.6%	1	2.5%	24				81.6%	375
24	17.03	1,408	54.6%	1	2.5%					54.6%	769
25	18.01	4,012	38.4%	1	2.5%	1				77.5%	3,109
26	18.02	776	24.7%	1	2.5%	1				77.5%	601
27	18.03	14,968	20.3%	1	2.5%	1				77.5%	11,600
28	18.04	1,895	36.1%	1	2.5%	1	27			77.5%	1,469
29	18.05	2,546	32.8%	1	2.5%	1	3			77.5%	1,973
30	20.01	6,381	33.7%	1	2.5%	21				33.7%	2,150
31	21.01	13,949	10.0%	1	2.5%					10.0%	1,395
32	23.01	2,626	66.2%	1	2.5%	1	5			77.5%	2,035
33	23.02	3,094	40.3%	1	2.5%	1	5			77.5%	2,398
34	24.01	4,475	48.3%	1	2.5%					48.3%	2,161
35	25.01040512	5,019	38.5%	1	2.5%	61				38.5%	1,932
36	25.0203	1,673	9.5%	1	2.5%	1	5			77.5%	1,297
37	25.06	1,014	2.2%	1	2.5%	61				35.2%	357
38	25.0711	4,665	2.2%	1	2.5%	63				17.0%	793
39	26.01	4,806	67.1%	1	2.5%					67.1%	3,225
40	26.02	3,124	90.0%	1	2.5%					90.0%	2,812
41	27.01	13,914	72.2%	1	2.5%					72.2%	10,046
42	28.01	32,111	74.0%	1	2.5%					74.0%	23,762
43	28.02	455	63.7%	1	2.5%	42				74.0%	337
44	29.01	177	93.1%	1	2.5%	1	3			93.1%	165
45	29.02	29	100.0%	1	2.5%	1	3			100.0%	29
46	31.01	29,740	57.9%	1	2.5%					57.9%	17,219
47	33.01	52	83.9%	1	2.5%	1				83.9%	44
48	33.02	103	89.9%	1	2.5%	1				89.9%	93
49	34.01	355	0.2%	1	2.5%	61				35.2%	125
50	35.01	164	54.7%	1	2.5%	46				57.9%	95
51	36.01	2,002	63.0%	1	2.5%					63.0%	1,261
52	39.01	460	80.0%	1	2.5%	1				80.0%	368
53	40.01	400	67.0%	1	2.5%	31				67.0%	268
54	41.01	960	15.3%	1	2.5%	61				35.2%	338
55	42.01	9,908	71.7%	1	2.5%					71.7%	7,104
56	42.02	956	80.2%	1	2.5%					80.2%	767
57	43.01	1,568	30.3%	1	2.5%	46				57.9%	908
58	44.01	23,833	24.6%	1	2.5%	1	3			77.5%	18,471
59	45.01	8,720	27.0%	1	2.5%					27.0%	2,354
60	46.01	11,673	57.8%	1	2.5%					57.8%	6,747
61	47.01	19,632	35.2%	1	2.5%					35.2%	6,910
62	47.02	965	25.9%	1	2.5%					25.9%	250
63	47.03	558	17.0%	1	2.5%					17.0%	95
64	48.01	1,115	81.2%	1	2.5%	19				81.2%	905
65	49.01	9,113	26.6%	1	2.5%					26.6%	2,424
66	50.01	1,187	87.1%	1	2.5%	1				87.1%	1,034
67	51.01	626	13.8%	1	2.5%	1	5	71	72	77.5%	485
68	51.02	1,900	47.6%	1	2.5%	1	5	72		77.5%	1,473
69	51.03	1,166	44.2%	1	2.5%	1	5			77.5%	904
70	51.04	1,718	30.0%	1	2.5%	1	5	72		77.5%	1,331
71	51.05	12,325	17.6%	1	2.5%	1	5	72		77.5%	9,552
72	51.06	586	9.7%	1	2.5%	1	5			77.5%	454
73	51.07	1,244	18.2%	1	2.5%	1	5			77.5%	964
74	52.01	3,454	41.9%	1	2.5%					41.9%	1,447
75	52.02	15,086	35.3%	1	2.5%	74				41.9%	6,321
76	53.01	725	63.1%	1	2.5%	77				63.1%	457
77	53.02	673	55.2%	1	2.5%					55.2%	371
78	55.01	192	26.3%	1	2.5%					26.3%	50
79	57.01	1,183	57.5%	1	2.5%	1				77.5%	917
80	58.01	651	40.9%	1	2.5%	31				40.9%	266
81	59.01	1,063	11.1%	1	2.5%	1				77.5%	824
82	61.01	558	29.6%	1	2.5%	1				77.5%	432
83	61.02	406	23.9%	1	2.5%	1				77.5%	315
84	Direct	495,200	0.0%	1	2.5%					2.5%	12,380
TOTAL		1,223,320	41.3%								505,268

\*Include only TSS generated in the watershed that drains directly to the BMP. Do not include any TSS that first drains to an upstream BMP  
 \*\*TSS attenuation rate of BMP. Enter "0" if no BMP.