City of Hartford
Storm Water Quality Management Assessment

EXECUTIVE SUMMARY

This report presents the results of the analysis performed by Graef Anhalt Schloemer and Associates, Inc. (GAS), to assess whether the City of Hartford is in compliance with the Total Suspended Solids (TSS) removal requirements, as set forth by the Wisconsin Department of Natural Resources (WDNR). The City is to achieve 20 percent removal of TSS in storm water runoff on a community-wide basis. This requirement was to be met by March 10, 2008. A computer model entitled SLAMM (Source Loading and Management Model), as approved by the WDNR, was used to calculate the yield in pounds of TSS generated by the City under "no controls" conditions. These conditions mean that standard land use files for different land uses and an assumed distribution of road smoothness was used. These conditions also mean conditions without the use of Best Management Practices (BMP'S) such as: street sweeping, catch basins, bio-filtration, wet detention, or swale drainage. This model was used as the base model for the analysis.

The pollutant loading calculations were performed to determine the yield in pounds of TSS generated at each major outfall. Pollutant loading calculations were performed for each catchment area associated with a major outfall. Please see Figure 4, Outfall and Catchment Areas Map. Each catchment area was analyzed under "no controls" and "with controls" conditions, and compared to determine a net decrease in pollutant loading. "With controls" conditions are applied to the developed urban area, including practices and facilities under existing and proposed conditions. The controls that were input and used in the model were based on information such as Storm Water Management Plans for developments within the City that were provided by the City. Recommendations were to be made as to how the City of Hartford could implement controls if it was determined by the results of the analysis that the TSS removal requirements for 2008 were not being met, These recommendations will work towards achieving the next TSS removal requirement of the WDNR, which is 40 percent removal by March 10, 2013.

The City of Hartford is achieving 20 percent removal of TSS on a community-wide basis. Additional best management practice (BMP) controls will need to be implemented to meet the WDNR pollutant loading removal goal of 40 percent by March 10, 2013.

Several recommendations on how the City of Hartford can work to achieve the 40 percent removal goal by March 10, 2013 are included in the Conclusions/Recommendations section of this report. Figure 6, at the back of this report, is a map showing the recommendations.

BACKGROUND

The City of Hartford was issued an MS4 General Permit (WPDES Permit No. WI-S050075) by the Wisconsin Department of Natural Resources (WDNR) on November 1, 2006. One of the requirements of the permit is that the City of Hartford comply with the Total Suspended Solids (TSS) removal requirements of the WDNR. The initial requirement is that by March 10, 2008, 20 percent of the TSS be removed from storm water runoff generated within the City on an average annual basis. The subsequent requirement is that 40 percent of the TSS be removed by March 10, 2013 on an average annual basis.

The City of Hartford sent out a Request for Proposals to procure a firm to analyze, by use of performing pollutant loading calculations, whether the City is in compliance with the 20 percent TSS removal requirement. Recommendations were to be made on how the City Hartford could reach compliance of the 40 percent TSS removal requirements by March 10, 2013. Graef Anhalt Schloemer and Associates, Inc. (GAS) was retained by the City in March of 2008 to perform this assessment.

The City of Hartford is a community of approximately 14,000 people located in Washington and Dodge Counties. Figure 1 shows the location of the City. The City was established in the mid-1840's. Growth within the City began as Rossman's Saw Mill was constructed on the Rubicon River. Growth was accelerated when a Milwaukee-La Crosse rail line was constructed in 1855. The City, as it is today, consists of an historic downtown area. The City has stressed that this area, being the oldest portion of the City, is of concern and needs to be reviewed to see if opportunities exist to provide water quality benefits given the fact that the area is built-out and does not have much pervious area.

Well-maintained, older neighborhoods extend out from the downtown area in all directions. The western end of the City contains industrial and commercial land. Commercial land is also prevalent in the southern portion of the City, particularly along the State Highway 83 corridor. Large amounts of commercial land and some institutional land is located on the east side of the City along the State Highway 60 corridor. Figure 2 shows existing land use within the City of Hartford.

DATA COLLECTION

A Project Kick-Off Meeting was held at the City of Hartford on March 24, 2008. In attendance were representatives of GAS and Mr. William Ripp, City Engineer with the City of Hartford. The City provided mapping of their storm sewer system and a City Zoning Map. Additional mapping was provided showing the locations of residential, commercial, industrial, and institutional developments within the city limits. This information was essential to the development of the modeling as it allowed for the accurate input of land use information which is a key component in the calculation of TSS removal. Binders were also provided containing photographs and storm water maintenance agreements for developments within the City. This information along with the previously mentioned mapping was provided to assist in the development of the SLAMM models.

The City of Hartford provided GAS with the Storm Water Management Plans for developments. These plans contained calculations showing stage-storage relationships and outlet structure designs for storm water detention and treatment facilities. This information was input into the models as "controls" used for the purpose of removing TSS, creating the "with controls" models. Additional information provided by the City of Hartford included street sweeping schedules. These schedules are included as Appendix B of the report.

ANALYSIS CRITERIA

SLAMM was originally developed to better understand the relationship between sources of urban runoff pollutants and runoff quality. SLAMM is mainly based on field observations, with minimal reliance on theory that has not been documented or confirmed in the field. SLAMM has placed an emphasis on small storm hydrology. Storm water quality problems are mostly associated with common and relatively small rainfall events. SLAMM incorporates unique process descriptions to more accurately predict the sources of runoff pollutants and flows for the storms of most interest in storm water quality analyses.

The criteria used for this analysis were obtained from the WDNR and the City of Hartford. Some of the criteria were obtained from Benjamin Benninghoff, Water Management Specialist for Washington County and Pete Wood, Storm Water Specialist. The other criteria used were from the Department of Natural Resources-Chapter NR 151-Runoff Management. a WDNR Guidance Memorandum dated June of 2005. A copy of this memorandum is included in this report as Appendix A. The following is a summary of the criteria used in the analysis:

- Developed areas not subject to the Post-Construction Performance Standards that went into effect October 1, 2004 and that drain to the Hartford MS4 (Municipal Separate Storm Sewer System) were included in the analysis.
- Areas covered by a WDNR NOI (Notice of Intent) submitted prior to October 1, 2004 were included.
- In-fill areas less than 5 acres were treated as developed with land uses similar to those around them.
- Catch Basins with one-foot sumps were used as a control in the model.
- Conservancy, Riparian, and Agricultural areas were not included in the analysis. Please see Figure 3 which is a map showing areas excluded from the analysis.
- Industrial facilities that have an Industrial NR 216 Permit do not need to be included in the analysis.
- Development areas constructed after October 1, 2004 did not need to be included within the modeling. WDNR considers that after this date, storm water management facilities are all constructed with controls.

The Southeastern Wisconsin Regional Planning Commission's (SEWRPC) 2005 Aerial photography was used in conjunction with topographic survey, zoning mapping, and storm sewer system data to determine land cover types, catchment areas, outfall locations, and riparian and exclusion areas. The various mapping and photography data were also used to identify potential areas that could be used to retrofit new stormwater treatment practices. The SLAMM batch processor function was used to determine the area quantities for each surface type based on different zoning districts. Each model was run using a silty SCS Hydrologic soil type, Wisconsin input data files and the Milwaukee 5 year rainfall file and appropriate date range. Controls such as wet detention basins, catch basins, and swales systems were added into the respective catchment models. The results of the each catchment analysis are shown in Appendix D, with the TSS Removal Rate Summary shown in Appendix C.

ANALYSIS RESULTS

Based upon the results of the SLAMM modeling analysis, the City of Hartford has achieved approximately 20 percent TSS removal on a community-wide basis. Please refer to the following Table 1 for a summary of the TSS removal results. Refer to Appendix C and D for additional details of the analysis.

TABLE 1
TSS REMOVAL RATE

Catchment Name	Catchment Area (acres)							Particulate Solids Yield (lbs)	Particulate Solids Yield (lbs)	Percent REMOVED
	Residential			Institutional	Commercial	Industrial	Total	NO CONTROLS	WITH CONTROLS	
	High Density	Medium Density	Low Density							
Northeast										
NE-1					21.90		21.90	4,233	1,438	66%
NE-2		15.86					15.86	10,780	1,351	87%
NE-2		14.99					14.99	10,188	1,749	83%
NE-3		26.35					26.35	17,910	5,384	70%
NE-3		14.65					14.65	9,957	1,873	81%
NE-4		21.07					21.07	14,321	3,893	73%
NE-4		54.81					54.81	37,254	9,251	75%
NE-5		52.66		9.31			61.97	47,880	45,351	5%
NE-6		18.48		16.63			35.11	34,152	32,622	4%
NE-7		5.82		1.72			7.54	6,189	5,881	5%
Northwest										
NW-1		6.63			58.86		65.49	19,777	13,816	30%
NW-2		14.02					14.02	9,529	8,929	6%
Northcentral										
NC-1						31.89	31.89	59,530	59,211	1%
NC-2a						10.65	10.65	19,881	19,780	1%
NC-2b		46.77					46.77	31,789	9,915	69%
NC-2c		31.47					31.47	21,390	15,292	29%
NC-2d	10.92	130.68		13.87	7.79	61.27	224.53	241,730	232,165	4%
NC-2e						17.05	17.05	31,828	23,754	25%
NC-3						5.18	5.18	9,670	9,481	2%
NC-4		21.30		1.19			22.49	16,022	15,063	6%
NC-5	4.04	22.78		6.77	6.00		39.59	35,940	34,307	5%
NC-6		20.15			3.21		23.36	17,874	16,904	5%
NC-7		27.58			0.51		28.09	19,410	18,250	6%
NC-8		16.29		0.78		11.98	29.05	34,448	33,213	4%
NC-9						3.55	3.55	6,627	3,542	47%
East										
E-1		8.34					8.34	2,877	2,704	6%
E-2		21.90					21.90	14,885	2,657	82%
E-2		3.68					3.68	2,501	664	73%
E-3		7.83					7.83	4,307	4,138	4%
E-4		14.88					14.88	10,114	9,802	3%
E-5a		8.64					8.64	5,872	1,631	72%
E-5b		8.73					8.73	5,933	2,646	55%
E-5c		20.94					20.94	11,844	11,047	7%
E-6		4.23					4.23	2,875	360	87%
E-7a	3.90	1.67					5.57	3,786	177	95%
E-7b		15.66					15.66	10,644	10,228	4%
E-7c		1.63					1.63	1,108	335	70%
E-8	45.58	39.42		6.89	59.36		151.25	156,575	153,579	2%
E-9		4.73		4.84			9.57	9,499	9,331	2%
E-10	13.58	8.23		11.42	0.69		33.92	34,250	33,835	1%
West										
W-1a						36.88	36.88	68,845	17,561	74%
W-1c						10.03	10.03	18,724	4,244	77%
W-1f						33.05	33.05	61,696	18,175	71%
W-1						124.37	124.37	232,224	214,944	7%
W-2						4.81	4.81	8,979	8,818	2%
W-3						16.47	16.47	30,994	21,463	31%
W-4		6.33				51.55	57.88	100,533	96,368	4%
South										
S-1		22.89		2.30			25.19	18,544	17,988	3%
S-2a	5.49	26.34					31.83	23,131	22,469	3%
S-2b		47.87					47.87	32,536	31,979	2%
S-2c		42.11	14.59	1.71			58.41	38,057	36,411	4%
S-2d		11.73					11.73	7,973	1,154	86%
S-2e		16.14					16.14	10,970	1,864	83%
S-3				5.09			5.09	6,609	6,508	2%
S-4				5.00			5.00	6,492	1,487	77%
S-5		6.24					6.24	4,241	4,098	3%
Southwest										
SW-1				14.54	17.28		31.82	41,372	40,710	2%
SW-2a		68.03					68.03	46,241	3,821	92%
SW-2b		84.66		17.70			102.36	79,894	33,439	58%
SW-2c		5.59					5.59	3,799	891	77%
SW-2d		13.81		0.89	2.87		17.57	14,278	13,687	4%
Southcentral										
SC-1				3.19			3.19	4,141	4,011	3%
SC-2	5.97	75.42		8.59	11.97		101.95	84,099	79,780	5%
SC-3a		26.95					26.95	18,318	6,223	66%
SC-3b	52.48	216.59	24.66	106.38	67.03		467.14	435,018	385,098	11%
SC-4		4.39			1.61		6.00	5,068	4,813	5%
SC-5		16.72		1.14	9.20		27.06	24,537	23,404	5%
SC-6	0.64	9.75		1.91	14.30		26.60	27,897	26,793	4%
SC-7	2.26	49.42		0.46	0.07		52.21	36,725	35,664	3%
						Total Solids		2,537,314	2,029,414	
						Total Solids REMOVED			507,900	
						Percent Total Solids REMOVED			20%	

RECOMMENDATIONS

The purpose of this analysis was to assess if the City of Hartford is in compliance with the TSS removal requirements of the WDNR. Tables summarizing the yield in pounds of the "no controls" and "with controls" models, and the resultant TSS removal percentage achieved are included above and as Appendix C in this report. The results of our analysis indicate an approximate 20 percent TSS reduction.

Following are recommendations to work towards the goal of achieving a 40 percent reduction in Total Suspended Solids by March 10, 2013:

- The City of Hartford enter into Maintenance Agreements with owners of private storm water facilities for the purpose of performing maintenance on these facilities. The City of Hartford will be able to take credit for these facilities if these facilities were constructed prior to October, 2004.
- Increase the capacity of existing wet detention systems to achieve greater pollutant removal rates. One pond in particular would be the Settlement Ridge pond located in Catchment NC-2c. Please see Figure 5 for the locations of these systems.
- Convert existing dry detention facilities to wet detention basins. There are several dry facilities throughout the City, some of which are located at Hidden Creek (NE-5, 6 & 7), Rossman Elementary School (NE-2d), Gateway (E-1), Kissel Ridge (E-5c), Walgreens (E-8), industrial development off of Western Drive (W-4), Hartford Union High School (S-1 & SC-3b), and Summer Winds (S-2b). Figure 5 shows the locations of these facilities
- Incorporate wet detention or bio-infiltration facilities into high pollutant producing areas, such as catchments W-1, NC-2d, SC-3b. Please see Figure 4 for the locations of these catchments.
- Increase catch basin sumps to a minimum of 3 feet in densely developed areas, such as the downtown district. Retrofitting or catch basin replacement would be required.
- Other treatment options that could be incorporated into the downtown area could be porous pavement systems and green roofs. The benefit provided from these devices would be on a smaller scale and site specific.