City of Madison Policy
For Stormwater and the Improvement of Water Quality
In Lakes Mendota, Monona and Wingra

LEGAL REQUIREMENTS

While meeting the regulatory requirements listed below will improve the quality of stormwater that reaches the lakes, it is unlikely that the result will be a discernable difference in lake water quality. Other nutrient sources need to be addressed before there is a significant improvement in the area lakes. Major collaborative efforts such as the Yahara Lakes Legacy Partnership, which hopes to address both urban and rural sources, are vital in making progress towards noticeably cleaner lakes. However, at this time, the goal for lake quality has not been developed.

NR-216 and NR-151 Compliance

The City of Madison is currently permitted to discharge stormwater to "Waters of the State of Wisconsin" from our Municipal Separate Storm Sewer System (MS4), through a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. This permit is authorized under State Administrative Code NR-216. Both the Administrative Code and our permit require the City to take specific actions with regards to stormwater treatment, as listed in Administrative Code NR-151. The purpose of NR-151 is "to limit non-point runoff pollution in order to achieve water quality standards," and requires that municipalities with a Wisconsin Pollutant Discharge Elimination System (WPDES) permit be in compliance with the following:

1. Meet a 20% reduction of total suspended solids, compared to no controls, by 2008 (This has been met by the City of Madison.)
2. Meet a 40% reduction of total suspended solids, compared to no controls, by 2013

Other requirements of NR-151 include erosion and sediment control plans for construction sites as well as rigorous stormwater management targets for both new and redevelopment.

City Engineering staff estimate that with street sweeping and existing publicly owned detention basins, the City of Madison is currently controlling approximately 30% of the total suspended solids entering the local waterways. The City needs to increase its removal efficiency by another 10% by the year 2013. ***It is the belief of the City Engineering Division that compliance will not be achieved without the commitment of substantial resources in those areas that are not served by stormwater detention basins.***

TMDL

A Total Maximum Daily Load (TMDL) is written for water bodies listed on the EPA's 303d list of impaired waters, under the Clean Water Act. Currently, the Rock River is on the 303d list for sediment and phosphorous. Therefore, the portion of the City that is in the Rock River Watershed (all areas except the southwest corner, which drains to the Sugar River) is subject to the requirements of a TMDL, currently being written by the WDNR & EPA.

The TMDL will set water quality standards for all areas of the watershed discharging to the Rock River. The implementation portion of the TMDL will allocate the allowable load to the entities within that watershed, including municipalities with a WPDES permit, agricultural lands, sewage treatment plants, and some industrial point sources.

It is very likely that a TMDL will require more restrictive standards than the stormwater regulations in NR-216 or NR-151. Specifically, a restriction on the discharge of phosphorous to all regulated water bodies will almost certainly be established.

It may be in the best interest of the City of Madison for the City to submit a request for the establishment of a TMDL for the lakes in order to determine and address the phosphorus loads from urban areas versus that of agri-business. ***Unless the phosphorus loads from agri-business is addressed, the potential for reducing the nutrient loads to our lakes, and therefore water quality in the lakes in any substantial fashion is unlikely.***

PRIORITIES

Stormwater Discharge.
It is the intent of City Engineering to prioritize water quality improvements that will bring the City into further compliance with NR-216, NR-151 and any future TMDL. Expenditures shall be quantified and compared in order to determine the greatest reduction in suspended solids. In areas of the City developed within the past few decades, detention basins serve to treat stormwater runoff before it reaches the lakes.

At this time, City Engineering believes that the installation of proprietary catch basins in Aldermanic Districts 2, 4, 6, 8 and 13 (Major Basins MO 01, 02, 03, 04, 05, and 08) show the best promise to attain compliance with NR-151. Unfortunately, street sweeping has not proved effective in meeting the regulatory requirements.

In addition, the installation of retention basins is being considered for Northland Manor Park (AD 18), Delaware/Wheeler (AD 18) and at 2401 McKenna Boulevard. The City shall need to certify to the WDNR by March 31, 2011 regarding compliance initiatives. Stormwater models SLAMM (Source Loading and Management Model) or P8 will be used by City Staff to determine compliance.

The removal of visible pollutants not regulated by state code, such as trash and sand, shall receive a lower priority, but will preferably be addressed as a part of sediment removal. Where appropriate and in conjunction with street reconstruction projects, City Engineering shall install stormwater treatment devices that effectively remove sand and trash. If there is sufficient homeowner interest and where feasible, City Engineering shall also provide cost sharing for the installation of rain gardens in street terraces to filter street water and improve infiltration.

Another aspect of water quality that does not fall under state regulations is the view from the shoreline. Floating weeds and trash contribute to a poor perception of the actual quality of the lakes. Keeping shoreline areas clear of debris is an important step towards improving the public perception and enjoyment of the lakes. In 2008, City Engineering contracted with a company to clean up the shoreline along Monona Bay on a monthly basis and after major rainstorms. City Engineering is also working with Dane County to manage a barge that can collect trash from private piers as well as trash and weeds floating in the water. It is important to note that any resources the City puts toward

aesthetic improvements do not move us closer to the state mandated stormwater management goals.

Lake Management.

Since the mid-1970s, the responsibility for lake management has been assigned to Dane County with regulatory oversight by the WDNR. Given frequent flooding events over the last two decades and FEMA's determination to elevate the regional flood of Lake Mendota, the City is proceeding to take a more active role in the management of the Yahara Lakes.

On April 6, 2009, WDNR, Dane County and the City of Madison presented a "Water Level Short-Term Action Plan" to the public. The City's responsibilities include:

- Identify alternative/feasibility of modifying the STH 113 railroad bridge to increase the conveyance of the regional flood and reduce the height of the regional flood in the Cherokee Marsh;
- Complete the Lake Mendota portion of the hydraulic system model (INFOS[1]) and to expand this state-of-the art model to the other lakes in following years; and,
- To install a flow gauges on Starkweather Creek, and other key tributaries, to be used to provide data for the management of lake elevations and flows.

To enable the City of Madison to protect the property and fiscal interests of its residents and more accurately model the lake levels and pollutant loadings, accurate mathematical models of the lakes need to be developed and maintained. A model for Monona Bay and Lake Monona was created in a cooperative effort with the University of Wisconsin College of Engineering, and completed at the end of 2008. A model of Lake Mendota is being created at this time. City Engineering will continue to work with the University to create future lake models. City Engineering has been authorized a full time staff position to create, update and analyze model results.

BACKGROUND INFORMATION

PHOSPHORUS

Phosphorus is the primary limiting factor for algal growth in the Madison area lakes, and therefore is directly linked to eutrophication. Farming practices and erosion from construction activities are the primary sources of phosphorus.

Phosphorus is generally reported as either "soluble reactive phosphorus" or "total phosphorus". Soluble reactive phosphorus readily aids plant growth due to its dissolved state; its concentration varies widely over short periods of time as plants take it up and release it. Total phosphorus, however, remains more stable and is often a better indicator of a lake's nutrient status. The total phosphorus in Lakes Mendota and Monona peaks from July through October at about 60 µg/l (parts per billion).

The high phosphorus loads that occurred in the first half of the 1900's have accumulated in the lake sediments and continue to impact lake water quality. During lake turnover in the deeper, stratified portions of the lakes or in shallow areas due to strong winds, sediment-laden water is mixed up into the water column, making more phosphorus available for algae growth. Therefore, even when external loads are dramatically

[1] Integrated Nowcast and Forecast Operational System

reduced, lake sediment acts as a reservoir that continues to release nutrients into the water.

MMSD PHOSPHORUS LOADINGS

Currently, Madison Metropolitan Sewerage District (MMSD) provides primary, secondary and disinfection treatment of the waste it receives. MMSD receives raw sewage, which has a total phosphorus content of approximately 6,000 µg/l.

Currently the average flow rate through MMSD is about 43 million gallons per day (MGD), or 783,700 lbs/yr of total phosphorus. Average effluent from the plant has a total phosphorus level of 390 µg/l, or 50,926 lbs/yr of total phosphorus discharged from the plant. There is a 93.5% reduction in total phosphorus levels from waste to effluent. The captured phosphorus is land spread through Metrogrow.

URBAN PHOSPHORUS LOADINGS

Developed areas in the City of Madison contribute approximately 28,435 pounds of total phosphorus each year, which includes atmospheric deposition and runoff from streets and established lawns. Of the total amount of phosphorus, about 68% (19,300 pounds) is *particulate* phosphorus, which can be captured by stormwater treatment practices. It is estimated that the city currently treats 39% of the particulate phosphorus in stormwater through street sweeping, treatment devices, detention ponds, and other practices.

Attachments: In order to track the tasks referred to in this Policy, a Stormwater Management Project Schedule is attached.

Larry D. Nelson, P.E.
City Engineer

SUMMARY OF PHOSPHORUS SOURCES

City of Madison (Urban) Total Phosphorus Loadings		
	Average Yield	Average Concentration
	(lbs/acre/year)	*(µg/l)*
Downtown Commercial	1.11	205.9
Single Family Residential	1.02	580.6
High Density Residential	1.20	328.8
Light Industrial	1.12	278.6
Values reported from Source Loading and Management Model (SLAMM)		

Madison Metropolitan Sewerage District (MMSD) Total Phosphorus Loadings		
	Total	Concentration
	(lbs/year)	*(µg/l)*
Influent to MMSD	783,691	6,000
Effluent from MMSD	50,925.53	390

In-Lake Total Phosphorus			
	Average Concentration	Peak Concentration	Sediment Concentration
	(µg/l)	*(µg/l)*	*(µg/g)*
Lake Mendota Spring	107	207	1.4*
Lake Mendota Summer	167	1,520	
Lake Mendota Fall	209	803	
Lake Monona Spring	81	275	1.3*
Lake Monona Summer	206	786	
Lake Monona Fall	197	920	
Monona Bay			0.8 **
Data tabulated from 1998 through 2007 from North Temperate Lakes Long Term Ecological Research (LTER) * From Perspectives on the eutrophication of the Yahara Lakes, Richard C. Lathrop, 2007 ** Value reported from 2006 WRM Practicum: Watershed and Management Plan for Monona Bay			