PROTECTING WISCONSIN'S WATER

A CONSERVATION REPORT AND TOOLKIT

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EXECUTIVE SUMMARY

Wisconsin citizens hold the state's natural resources dear to their hearts, especially the beauty, recreation and economic benefits provided by the state's waters. And for good reason: bordered by two Great Lakes and the Mississippi River, Wisconsin contains over 15,000 inland lakes and 84,000 miles of rivers and streams.[1]

It is these same natural resources that support the state's $12 billion per year tourist industry, Wisconsin's third largest economic sector.[2] It is no surprise, then, that poll after poll demonstrates the people of Wisconsin, regardless of political party or demographics, are committed to the conservation of the state's waters for future generations.[3]

Yet, in conflict with this core value, Wisconsin has fallen behind in an increasingly important area of environmental concern: water conservation. This is true despite the fact that significant portions of the state – areas critical to the state's economic vitality and representing high population centers – are experiencing growing water quality and quantity problems. This emerging trend is of real concern to the state, for beyond its necessity for human life, water is essential to economic development and sustainability. Examples around the world demonstrate that an inadequate water supply jeopardizes human health and limits economic opportunities.[4]

Wisconsin needs a strong water conservation program to go hand in hand with an economic development plan. This Report provides policy recommendations to shape the future of water conservation in Wisconsin.

Section One identifies existing gaps in Wisconsin laws and regulatory systems, some of which provide economic incentives to waste water. Currently, no state law regards water conservation in a way that requires the actual implementation of conservation measures. Section 281.35 of the Wisconsin Statutes purports to require conservation practices for new or increased large-scale water withdrawals; however, the threshold used to trigger the conservation requirement – a "water loss" above two million gallons per day – is set so high that, practically speaking, only a handful of large-scale water withdrawals have been "big enough" to require conservation in the 20 years since the law's enactment.

This high threshold is self-defeating for the state in the long run. As demonstrated by the small number of water loss permits granted over the statute's 20-year history, the statute fails to deter inefficient water waste on the part of most of the state's water users. The law's failure will continue to hinder Wisconsin's ability to mitigate local water shortages, like those presently arising in critical portions of the state – local situations which, unless appropriately managed, have the potential to strain state resources and to require more governmental regulations. Other than Wisconsin's Wellhead Protection Program, the state has no specific program that requires, funds or otherwise promotes water conservation. Yet, Wisconsin's Wellhead Protection Program, while identifying water conservation as an objective, fails to require communities seeking a new well to actually implement a water conservation program. With no financial incentives provided to communities and no implementation or enforcement parameters, the Program's conservation component is little more than apaperwork requirement.

This Section also examines gaps in state laws and regulations regarding the use of reclaimed or recycled water. Reuse of treated wastewater may provide a number of benefits germane to conservation, including groundwater recharge and demand reduction. Unlike other states, Wisconsin has yet to enact any state regulations or guidelines specifically addressing water reuse for purposes other than limited irrigation applications. Further inquiry is needed to determine whether and to what extent existing state water quality regulations serve to restrict the use of large-scale water recycling systems in Wisconsin.

Next, the Report evaluates shortcomings in the state's land use laws and policies in terms of water conservation. Without appropriate prioritization of groundwater concerns and the commitment to undertake integrated water management plans under the state's "Smart Growth" program, Wisconsin communities' efforts to protect water supplies and to forge an environmentally sustainable future will be compromised.

The Report next examines Wisconsin's Public Service Commission's (PSC) role in creating a clear financial disincentive to conservation. The Wisconsin PSC has the authority to set the rate structure for the state's water utilities and has selected the declining block rate as its statewide pricing structure. Under this rate structure, the more water that is used, the less a customer pays per unit, thereby creating a disincentive to conserve water. Consistent with this rate selection, the PSC is virtually silent on the topic of water conservation. Given the reality of Wisconsin's increasing water concerns in highly populated portions of the state, the PSC would be wise to take a closer look at the state's present rate structure and adopt alternatives that favor water conservation, particularly within the two designated Groundwater Management Areas where current water supplies are both dwindling and contaminated.

Yet another potential impediment to conservation is the state's failure to prohibit large-scale water users from "opting out" of available municipal systems. The legal ability to opt out of a municipal system deters and undermines utilities' implementation of water conservation measures, given the buying power yielded by large industrial users that may opt out of the system if such measures are required.

In counterpoint to the gaps and disincentives identified under Wisconsin law, the Report assesses the conservation opportunities that exist under current and emerging law. As one such opportunity, Wisconsin's Groundwater Quantity Act of 2004, establishes a Groundwater Advisory Committee, charged with the development of a coordinated groundwater management strategy to include best management practices and water conservation measures.

The Annex 2001 Implementing Agreements – Great Lakes water policies that will be considered in the coming months and years – may provide additional opportunities for conservation, as applicants for new or increased water withdrawals of 100,000 gallons per day could be required to meet conservation requirements and states and provinces could be required to develop conservation programs.

Opportunities to coordinate efforts between local governmental bodies and other regional stakeholders can be optimized to move towards improved regional cooperation and adoption of a comprehensive water resource management plan for southeastern Wisconsin. Finally, Governor Doyle's recently announced "Conserve Wisconsin Initiative" calls for the development of a conservation plan for the state. Thus, while current state laws and policies impede water conservation objectives in many respects, several opportunities exist to help Wisconsin conserve water and increase its sustainability.

Section Two of the Report explores additional water conservation opportunities for Wisconsin by describing existing best management practices and conservation initiatives. This Section provides a water conservation toolkit to guide decision-makers who are designing and implementing conservation plans. Section Three applies the Conservation Toolkit, developed in the previous section, to the City of Waukesha, Wisconsin. This Section provides an outline of key conservation measures and best management practices to assist Waukesha's development of a comprehensive water conservation plan for the community.

With the available information at hand, together we can move Wisconsin's conservation policies toward the common goal of an environmentally sustainable future.

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SECTION I: GAPS AND OPPORTUNITIES FOR CONSERVATION IN WISCONSIN

Introduction

Despite the fact that conservation of the state's natural resources remains a core value of Wisconsin citizens, state policies are lagging in the increasingly important area of water conservation. The ready explanation is that, comparatively speaking, Wisconsin is a water rich state with its 30-plus inches of precipitation a year and extensive groundwater resources.[5] Yet, there is no denying that significant portions of Wisconsin are experiencing both water quality and water quantity problems.

The scientific community is helping us understand the depth of our water shortages, and the public discourse has increasingly reflected an anxiety about water security. Many renowned conservationists before us, including Wisconsin's Aldo Leopold, have advised us to live within the carrying capacity of the land. One essential means to reaching this objective is conservation.

Water conservation measures aim to preserve quantities of water sufficient to sustain economic and agricultural uses, drinking water supplies, and water-dependent ecosystems within our environment. As part of the overall management of water, conservation is commonly associated with water demand management strategies aiming to reduce human consumption and demand for water.

Another less common approach to water conservation focuses on the reuse and reclamation of water as an alternative to standard "once-through" water systems (where water is withdrawn, used once, treated and discharged) to optimize the numerous beneficial uses of treated wastewater or "gray water" for groundwater recharge, irrigation, wetlands restoration and industry.

Despite increasingly publicized accounts of global water shortages and contamination problems, many people persist in viewing water as something that will always be available, something to take for granted. Even when people recognize the logic inherent in water conservation measures, they may continue individual behaviors adverse to conservation. This ultimately requires policymakers to establish laws and devise rules that deter certain conduct and encourage others.

Wisconsin law is riddled with gaps and provisions that actually discourage water conservation. This section will highlight those gaps so those interested in water conservation can take action to promote better stewardship of our water.

Water conservation has been defined as the actions taken to reduce water use by improving the efficiency of various uses of water.[6]

WATER CONSERVATION:
GAPS & OPPORTUNITIES UNDER WISCONSIN LAW

GAPS	OPPORTUNITIES
Absence of State Legislation Requiring Water Conservation	Amendment of Wisconsin Statute § 281.35 to Require Conservation Plans for All New or Increased Water Withdrawals in Excess of 100,000 Gallons Per Day
Regulatory Void Regarding Reclaimed Water	Bolstering Wellhead Protection Conservation Programs Groundwater Quantity Legislation's Directives for Groundwater Management Areas (GMAs) Annex 2001 Implementing Agreements' Conservation Requirements Conserve Wisconsin Initiative
Failure of State and Local Land Use Laws and Annexation Policies to Protect Regional Groundwater Supplies	Local Utilization of Smart Growth Planning and Funding to Prioritize Groundwater and Surface Water Conservation and Management
PSC's Declining Block Rate Structure "Opt Out" Potential	Water Conservation Pricing Regulatory or Statutory Preclusion of Opt Out
Lack of Local and Regional Cooperation Among Municipalities and Stakeholders	Development of a Regional Groundwater Management Plan as Binding Contract SEWRPC Reform and/or Expanded Regulatory Authority Groundwater Advisory Committee's Statutory Charge Under 2003 Wisconsin Act 310 to Develop a Coordinated Groundwater Management Strategy for GMAs

Gaps and Opportunities for Conservation Under Wisconsin Law

Currently, there is no Wisconsin law that requires water suppliers or end users to implement conservation measures or to have a formal conservation plan in place.

On the federal level, water conservation is promoted through two laws: sthe Energy Policy Act of 1992 and the Safe Drinking Water Act. First, the Energy Policy Act of 1992 established national maximum allowable water use rates for plumbing fixtures (toilets: 1.6 gallons per flush; urinals: 1.0 gallons per flush; showerheads and faucets: 2.5 gallons per minute) in new and renovated residential and nonresidential facilities.[7] By 2020, the date by which most existing fixtures will be replaced, it is estimated that the Act will save six to nine billion gallons of water a day and reduce national water consumption by three to nine percent.[8]

Second, amendments to the Safe Drinking Water Act promote water conservation by requiring the U.S. Environmental Protection Agency to publish guidelines to assist public water systems' development of water conservation plans. At their discretion, states may require water systems to submit water conservation plans consistent with these federal guidelines (or any other guidelines) as a condition of receiving a loan from the Drinking Water State Revolving Fund.[9] However, Wisconsin does not require its utilities to meet this conservation condition, and the nominal funds available in the state's Drinking Water Revolving Fund fail to provide an economic incentive sufficient to offset the federal loan's substantial paperwork requirements.[10]

The Great Lakes Charter's Legacy in Wisconsin: Conservation Plan But No Implementation

In 1985, the governors of the eight Great Lakes states signed the "Great Lakes Charter," a voluntary agreement to provide consistent Great Lakes water policies among the jurisdictions. Among other things, the Charter encouraged water conservation and consultation among the states. After Governor Anthony Earl signed the Great Lakes Charter, Wisconsin acted to implement the Charter by creating a statute governing water withdrawals. This statute went beyond the Great Lakes Charter in that it also applied to Mississippi River Basin waters. A first for Wisconsin, the statute directed Wisconsin's Natural Resources Board to create a "water quantity resources plan for the protection, conservation and management of the waters of the state."[11]

It is unclear, in hindsight, whether the statute's top-down approach requiring planning with no implementation mandate was ineffective or whether there was a lack of political will. Regardless, it became apparent after several years, that although the Natural Resources Board fulfilled its statutory duty and created a plan, little to no headway has been made towards implementing the conservation plan.[12]

POLICY RECOMMENDATION:

- **State conservation planning requirements should be accompanied by implementation requirements.**

The Great Lakes Charter's Legacy in Wisconsin: A Paper Tiger

At least on paper, since 1985, Wisconsin law has required conservation for major water withdrawals, whether new or increased. Section 281.35 of the Wisconsin Statutes requires that persons seeking new or increased withdrawals resulting in a "water loss" averaging more than two million gallons per day in any 30-day period apply for and obtain a water loss permit.[13]

The statute further requires that, as a condition precedent to obtaining a water loss permit, applicants must describe the "conservation practices" they intend to follow.[14] Among the various grounds for approval, the applicant must show that its current water use "incorporates reasonable conservation practices."[15] As an additional ground for approval, if the withdrawal is an inter-basin transfer, the state or province to which the water will be diverted must demonstrate that it "has developed and is implementing a plan to manage and conserve its own water quantity resources, and that further development of its water resources is impracticable or would have a substantial adverse economic, social or environmental impact."[16]

Yet, despite this strong conservation language, from the early 1980s until two years ago, no water users had triggered the two million gallons per day water loss threshold. In the past two years, a handful of large power plants have met the threshold, but the DNR did not require these facilities to have conservation measures in place as a condition of permit approval.[17]

The statute's conservation provisions were not triggered by either the joint request in 1988 of the Village of Pleasant Prairie and the City of Kenosha to divert over three million gallons of water per day out of the Great Lakes Basin or the recent request by the Manitowoc Public Water Utilities to increase the amount of Lake Michigan water it withdraws by up to 30 million gallons per day or even the proposed Oak Creek power plants.[18] [19]

Indeed, the threshold used to trigger the conservation requirement – a water loss averaging in excess of two million gallons per day in any 30-day period – is set so high that, practically speaking, the majority of new or increased water withdrawals are excluded from the statute's conservation requirements.

Beyond the fact that Wisconsin Statute 281.35 is ineffective as a means to achieve water conservation, the statute's reliance upon complicated and unclear water loss calculations has resulted in a confusing and unnecessary regulatory process.

In order to calculate water loss for purposes of determining whether water loss averages exceed two million gallons per day over any given 30-day period, the statute requires the calculation of consumptive water use.[20] "Consumptive use" is defined in the statute as "a use of water of the state, other than an inter-basin diversion, that results in a failure to return any or all of the water to the basin from which it is withdrawn. 'Consumptive uses' include, but are not limited to, evaporation and incorporation of water into a product or agricultural crop."[21a]

Limited guidance is provided under NR 142.04(1)(g) regarding how to determine consumptive use. Consumptive use determinations vary based on the intended use of the withdrawn water, for instance, thermoelectric power generation, public use, irrigation, or industrial use; however, most of these determinations rely on the use of water loss coefficients.[21b]

An argument can be made that the DNR should adopt clearer rules for developing these coefficients and require that they be kept on file in accordance with NR 142. However, given the current statutory scheme, such measures would serve a very limited purpose. As demonstrated in the case study below, it is not necessary for the DNR to even conduct a water loss analysis to determine if a water loss permit is required except in those rare instances involving the very largest water withdrawals. Given the fact that most of the municipal utilities in the state have already undergone expansions and updates in recent years, the DNR does not anticipate many, if any, municipal utilities coming close to triggering the two million gallon per day threshold in the foreseeable future.[22] The only applicants that have ever been required to obtain a water loss permit are those constructing large gas fired thermoelectric power plants using cooling towers instead of once-through cooling systems.

Thus, while perhaps providing an administrative convenience by curtailing the number of water loss permits being processed and issued over the years, Section 281.35 supports a regulatory course that will be self-defeating for the state in the long run. As demonstrated by the small number of water loss permits granted over the statute's 20-year history, the statute's high threshold and water loss provisions fail to deter inefficient water waste on the part of most of the state's water users. The state's failure in this respect harms its ability to prevent local water shortages, like those presently arising in critical portions of the state – local situations which, unless appropriately managed, ultimately have the potential to strain state resources and to require more governmental regulations.

A better solution, as recommended below, would be to amend Wisconsin Statute 281.35 to eliminate the statute's current threshold and water loss provisions and, in place

CASE STUDY: Central Brown County Water Authority Deal to Withdraw up to 30 Million Gallons Per Day from Lake Michigan

The recent request by Manitowoc Public Utilities to increase the utility's current rate of withdrawal of Lake Michigan water by up to 30 million gallons per day illustrates these points plainly. The utility sought the increase in order to supply water to the Central Brown County Water Authority, which needed Lake Michigan water to replace its own contaminated groundwater.

Even with a project of this magnitude, the DNR concluded that the two million water loss threshold wasn't exceeded.[24] [25] The DNR thus informed the utility that it could proceed with the increased withdrawal without the need to obtain a water loss permit provided other necessary permits and approvals were obtained.

As a result, with no water loss permit under consideration, neither the utility nor the water authority was required to comply with any of the conservation provisions. Although questions remain as to whether the DNR properly calculated water loss for purposes of determining if a water loss permit was in fact required, the case surely demonstrates the ineffectiveness of the statute as a conservation tool.[26]

thereof, require the implementation of conservation measures for all water users seeking new or increased withdrawals in excess of 100,000 gallons per day,[23] irrespective of any calculation of water loss or consumptive water use.

POLICY RECOMMENDATION:

- **Wisconsin Statute § 281.35 should be amended to change the two million gallon per day trigger to 100,000 gallons per day. This would require all entities seeking new or increased water withdrawals in excess of 100,000 gallons per day, regardless of water loss or consumptive water use, to have implemented conservation measures prior to approval of the proposed withdrawal. A bright line rule like this can be applied simply and uniformly.**

- **Whereas the current statute's conservation provisions fail to have an impact on the vast majority of new and increased water withdrawals occurring within the state, the recommended change will encourage local efficiencies, thereby preventing costly local water conflicts. Furthermore, not only is the 100,000 gallons per day threshold consistent with the high capacity well permit threshold under the Groundwater Quantity Act of 2004, but the proposed statutory amendment is consistent with the draft 2005 Annex Implementing Agreements and the goals of the Governor's Conserve Wisconsin Initiative.**

Wellhead Protection Program Lacks Implementation

Although Wisconsin's Wellhead Protection Program identifies water conservation as an objective, it has failed to accomplish its conservation goals. Designed to protect public water supply wells, the Wellhead Protection Program's primary goal is to prevent contaminants from entering public water supply wells by managing the land that contributes water to the wells.[27]

All communities installing a new municipal water supply well after May 1, 1992, must complete a Wellhead Protection Plan containing nine elements, including the development of a "water conservation program."[28] While the DNR identifies an array of water conservation measures, the DNR does not require the community seeking a new well to implement any of these measures. Rather, the state's role is limited to reviewing the "reasonableness" of the water conservation program included within the Wellhead Protection Plan of the municipal well. Other than this requirement, the DNR concedes that Wisconsin has no other specific program to promote or require water conservation.[29]

Moreover, there appear to be no financial incentives, like those offered under the Smart Growth law, provided to communities interested in launching a conservation program. In fact, no financial assistance of any kind appears to be available for community water conservation programs under Wisconsin's Wellhead Protection Program.[30] This void lies in contrast to the state's lake planning and lake protection grant programs, both of which are administered by the DNR and funded by water resources account funds arising from the motorboat gas tax.[31] Under these state programs, the financial incentive provided to local organizations involves grants to "assist lake planning projects," which provide 75% of the costs associated with their lake monitoring, education and planning work.[32]

Further demonstrating the low priority given to this aspect of the program, Wisconsin neither maintains a database keeping track of the communities that have water conservation programs nor tracks implementation of those programs.[33] As such, while there may be best management practices in place and municipalities who can teach others how to conserve, no such data has been gathered on a statewide level. Finally, like the state water conservation plan, the Wellhead Protection Program does not require implementation or enforcement, thus relegating the conservation component to nothing more than a paperwork requirement.

The lack of financial incentives, combined with no legal requirements to implement the conservation program, has resulted in another missed opportunity at the state and local level to increase the number of Wisconsin communities developing sustainable water uses.

POLICY RECOMMENDATION:

- **Amend the Wellhead Protection Program law to set water conservation goals, to require implementation of water conservation programs, and to provide financial incentives comparable to the state's existing lake planning grant program.**

Groundwater Quantity Act of 2004

Another gap in the law is that the newly enacted Groundwater Quantity Act does not require water conservation for high capacity well users. Despite this shortcoming, the Groundwater Quantity Act of 2004 provides a conservation opportunity.[34] While it focuses on the impacts of high capacity wells, the law directs the establishment of two Groundwater Management Areas (GMAs) to address water supply problems that have emerged from Wisconsin's current lack of an integrated water management approach. The GMAs will facilitate a coordinated management approach to regional water quality and quantity issues that cut across local government jurisdictions.

In addition, the statute established a Groundwater Advisory Committee, composed of municipal, environmental, agricultural and industrial interests, that is charged with the development of a coordinated strategy for addressing groundwater management issues, along with other directives.[35] One element of this strategy will be water conservation. The Groundwater Advisory Committee has until December 31, 2006, to provide the legislature's environmental standing committees with recommendations for "a mitigation program for GMAs, including Best Management Practices and water conservation measures."

POLICY RECOMMENDATION:

- **The Groundwater Advisory Committee should draft and recommend the promulgation of regulations requiring conservation for high capacity well permit holders.**
- **The Groundwater Advisory Committee should recommend implementation of a conservation program to mitigate water problems in the GMAs.**

Great Lakes Charter Annex Implementing Agreements

The summer 2005 draft of the Great Lakes Charter Annex 2001 Implementing Agreements provides additional opportunities for conservation. While this policy is still under review and development, this latest draft requires all new or increased withdrawals of 100,000 gallons per day average over 90 days to meet conservation requirements. The Agreement creates a Decision Standard that references conservation twice. First, the applicant must demonstrate that the need for all or part of the use "cannot be reasonably avoided through the efficient use and conservation of existing water supplies and, second, that implementation of the use will "incorporate Environmentally Sound and Economically Feasible Water Conservation Measures."[36]

The first requirement should be interpreted to require an applicant to actively conserve water prior to a request for a new or increased withdrawal. The Implementing Agreement provides a manual for reviewing applications in which it gives greater details about the meaning and intent of the Decision Standard. Regarding the first requirement, it states:

> **Water conservation and efficient use of existing water supplies must be an alternative that is pursued first to minimize or eliminate the need for the New or Increased Withdrawal.[37]**

In order to obtain approval for a new or increased water withdrawal above the trigger threshold, an applicant needs to show that its "need" cannot be "minimized or eliminated through the application of Environmentally Sound and Economically Feasible Water Conservation Measures…."[38]

Again, this appears to require the actual implementation of conservation measures and not simply theoretical projections about the impact of conservation measures. In addition, the drafts do not simply apply to new or increased withdrawals.

Moreover, the draft Agreements require the states and provinces to "develop and implement" conservation programs for all water users, not simply for new or increased water users above the trigger threshold. These conservation programs must "ensure improvement" of waters and "retain and restore the quantity" of Great Lakes ground and surface water.[39] The conservation program must anticipate the "potential impacts of cumulative effects and climate change."[40] Each program should include both demand and supply side conservation measures and incentives. Significantly, the program needs to include reporting, performance standards and monitoring.[41] However, the Agreements are silent on whether the conservation programs need to set voluntary or mandatory requirements.

By requiring existing users to undertake conservation consistent with a statewide or provincial conservation program, the policy reduces the likelihood that new or increased withdrawals may become necessary in the future.[42]

Although the states and provinces have given themselves five years to implement the conservation programs, the fact that implementation is required is an improvement over Wisconsin's legislation carrying out the Great Lakes Charter and the Wellhead Protection Program, neither of which required implementation and neither of which have been implemented. Still, the five year timeframe may indicate a reluctance to vigorously conserve water. In order to avoid repeating past failures, including the lack of implementation of the Great Lakes Charter, the Annex Agreements should require conservation programs to be in place prior to receiving an application for a diversion out of the Great Lakes Basin.[43]

These strides towards conservation are at risk of being compromised, however, by the draft Agreements' inclusion of the caveat that conservation measures and incentives be "economically feasible." The Agreements define this to mean that "Water management practices and water efficiency measures must be economically feasible based on a cost-benefit analysis that includes avoided environmental and economic costs."[44]

This caveat may very well undermine the implementation of conservation programs, as communities will undoubtedly utilize it as a legal loophole to limit their water conservation programs any time particular water conservation measures are deemed too costly. For example, under a cost-benefit analysis, a conservation measure could be deemed economically infeasible if it costs nominally more than a less beneficial alternative. The long-term costs of failing to conserve water likely will not be considered. Given political realities, when environmental savings are pitted against budgetary constraints, most often it is the environment that ends up on the losing end.

POLICY RECOMMENDATION:
The Annex Implementing Agreements should require:

- **Conservation by an applicant prior to allowing new or increased withdrawals of water over 100,000 gallons per day;**
- **Implementation of statewide or provincial conservation programs prior to allowing an application for a diversion of water out of the Great Lakes Basin;**
- **Implementation of a statewide mandatory conservation program; and**
- **Inclusion of a "stakeholder suit" provision, comparable to the Clean Water Act's citizen suit provision, to encourage implementation of the stated conservation requirements.**

Conserve Wisconsin Initiative

Unveiled in August 2005, Governor Jim Doyle's "Conserve Wisconsin Initiative" endeavors to protect Wisconsin's natural resources and to facilitate water supply planning for the state through legislation and executive orders.[45] While outlining a broad environmental plan, Conserve Wisconsin specifically addresses various water resource and energy issues, including the promotion of energy efficiency and the protection of Great Lakes resources, and calls for the development of a conservation plan for the state. Pursuant to this charge, the DNR plans to model the state's conservation program after the conservation provisions outlined in the 2005 draft Annex 2001 Implementing Agreements, discussed above, which should provide a strong conservation framework for the state to build upon.[46]

POLICY RECOMMENDATION:
- **The Conserve Wisconsin Initiative should include policy changes outlined in this *Protecting Wisconsin's Water Report and Toolkit*.**

Gaps and Opportunities for Reusing Water

Conserving water with reclaimed or reused water presents both a gap and an opportunity for Wisconsin. Water budgets are being used to assess the dynamic relationship between water inflows and water outflows in a given water system and can provide useful information in predicting the sustainability of a community's water supply. Many communities in Wisconsin currently operate at a water deficit, that is, they are using more water than is being replenished to their water supply.

Water deficits are a product, in many respects, of customary consumption and water treatment practices. Most water systems throughout the United States, including Wisconsin, use "wasting" or "once through" water systems – water is withdrawn, used once and then discarded. In the city of Waukesha, for example, water is drawn from underground aquifers, used and then discharged into the Fox River where it is transferred out of Waukesha's water system. In contrast, "recycling" systems reclaim used water, treat it and Reuse it for a number of beneficial purposes including groundwater recharge, irrigation, commercial uses and wetlands restoration.[47]

In attempting to develop and implement a water recycling system, it is important to understand federal and state laws regulating water reuse, water quality and water quantity. In 2004, the U.S. Environmental Protection Agency published federal guidelines pertaining to water reuse.[48] The document, however, is solely informational and does not impose legally binding requirements on the states or other entities.[49] As such, no federal regulations directly govern water reuse practices in Wisconsin or in any other state.[50]

Nonetheless, as of 2002, 25 states have adopted regulations regarding the use of reclaimed water.[51] A number of states, including Florida and California, have developed extensive water reclamation guidelines. In contrast, Wisconsin has not promulgated any state regulations or guidelines specifically addressing water reuse for purposes other than the irrigation of non-food crops.[52] Further inquiry is needed to determine whether and to what extent existing water quality and water storage regulations, practically, if not legally, restrict the use of large-scale water recycling systems in the state.

While a clear prohibition exists against underground injection systems that fail to meet drinking water standards, it has long been permissible under Wisconsin law to use treated wastewater for land applications, including groundwater recharge, once a WPDES permit has been obtained and state surface water quality standards have been met.[53] Although primarily intended as a means to treat rather than to reuse water, more than one hundred municipalities across Wisconsin, as well as numerous industrial facilities, already use treated wastewater in land use applications including seepage cells, infiltration basins, and spray irrigation.[54] For example, the City of Lake Geneva maintains one of the largest municipal land applications in the state.[55]

Where impediments nonetheless may arise is with regard to standards related to limits for total Nitrogen and Coliform. In order to meet these standards, treatment facilities may need to modify current wastewater treatment methods if water reclamation is to proceed to any large degree in this state. While in theory, wastewater plants can treat to any level, depending upon how much money their community is willing to spend, Wisconsin's locale and soil composition requirements are likely to prove cost prohibitive for large municipalities needing to acquire large tracts of land for seepage cell installation.[56]

This is especially true given the legal imperative that municipal systems pursue "cost effective" design solutions, which, as a practical matter, encourages communities to prioritize their bottom line over water quantity concerns.[57]

Given the state's failure to actively promote water reuse on any large-scale basis, the next important step for Wisconsin in moving towards a sustainable water supply is the development of strategies for the implementation of an institutional and regulatory framework for the use of reclaimed water. Wisconsin communities then would be in a better position to use reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.

POLICY RECOMMENDATION:

- **Wisconsin should commit to the development of an institutional and regulatory framework pertaining to the use of reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.**

Gaps and Opportunities in Land Use Planning

Annexation Policy Reform

Annexing land is a tool that communities use to expand their boundaries. Where and in what manner a community grows can determine whether water resources will be available to sustain the community's future needs and growth. The City of Waukesha's current approach to land annexation provides an instructive example.

CASE STUDY: An Annexation Policy at Odds with Sustainable Growth

The City of Waukesha's growth over recent decades has been dramatic and shows no signs of abating. According to the 2000 Census, the City of Waukesha has reached a population of 64,825 people, making it the state's seventh-largest city.[58] By the year 2030, the City estimates that its population will reach 85,000 people, a 27 percent increase since 2000.[59]

In pace with these population projections, the City of Waukesha has been significantly expanding its boundaries. Data provided from the City of Waukesha Department of Community Development's Planning Division demonstrates that the City, over the past 20 years, has increased in size from 15.5 square miles to 23.6 square miles, reflecting a 52% expansion.

Is this trend expected to continue? The answer is a resounding yes. In fact, over the next 25 years, the total residential acreage in the City of Waukesha is expected to grow by over 130 percent.[60] Low-density residential development, consisting of one to two homes per acre,[61] is predicted to experience the most explosive growth within the residential sector, with projected acreage at build-out greater than 1,000 percent of the acreage in 2004.[62]

Likewise, major expansions are planned for the water service boundaries of the Waukesha Water Utility consistent with the areas demarcated for "urban growth" or sprawl. [63] Indeed, rather than seeking to limit expansion of the service area in consideration of the city's growing water problems, the Utility's Master Plan provides for the expansion of the city's service boundaries both south and west of its current corporate limits to provide for an additional 13 square miles of developable land to facilitate the city's population growth and expansion.[64]

Absent coordinated efforts on the part of the Water Utility and the city's economic planners, Waukesha's expansion will certainly continue in upcoming years. Land-use planning that establishes open space goals, identifies groundwater recharge opportunities or advances other conservation-minded objectives has yet to become a priority for the city. To the contrary, city economic planners concede that consideration of such land use ordinances is still, at best, in the "infant stages," notwithstanding their recognition of the sheer number of residential developments to be constructed in upcoming years.[65]

Moreover, city planners concede that annexations of property bordering the city occur on a regular basis, as developers continue to buy up farmland and then petition the city for annexation. In the last five years alone, over 1,300 total acres have been annexed by the City of Waukesha, with over 4,413 total acres annexed in the past 15 years.[66]

Unlike other cities whose expansion is limited by the existence of neighboring cities, there exists no immediate impediments to the City of Waukesha's expansion.[67] Rather, the annexation process is simple and driven by land developers, who after buying up neighboring farmland,[68] initiate the process by petitioning the City Clerk for annexation. Following State Department of Administration review, and approval by the City Plan Commission, the city's Common Council invariably accepts the petition for annexation.[69]

In this fashion, unless the city undertakes containment measures, Waukesha's outward sprawl will continue unabated, property by property, acre by acre, development by development. The result – an ever growing demand for water at odds with an ever declining supply.

Smart Growth Utilization

Wisconsin's Comprehensive Planning Legislation, more commonly referred to as Smart Growth, reflects the culmination of a national movement led by public officials, developers, environmentalists and other community members seeking intelligent growth and land uses. Smart Growth endeavors to protect farmland, historic and cultural resources, and areas of natural scenic beauty and to guide development.

Enacted in October of 1999, Wisconsin's Smart Growth law requires that by 2010 every city, village, county and town in the state that undertakes certain land use related actions will be guided by a comprehensive land-use plan that addresses specific elements and goals.[70] Unlike the conservation program component of the state's Wellhead Protection Program discussed above, Smart Growth provides financial incentives through state grants and dividends to local governments that promise to meet certain criteria and successfully implement the comprehensive plans.[71]

Many land use activities have the potential to impact both the quality and quantity of a community's groundwater.[72] As to groundwater quality, an improperly sited landfill could end up leaching contaminants into the groundwater supply. Likewise, regarding groundwater quantity, as communities grow, land is paved over for roads, houses, shopping centers and parking lots, leading to the increased run off of precipitation into lakes and streams rather than its infiltration into the ground where it would recharge the underlying aquifers. The result – less water available for groundwater recharge at the same time that the growing community's demand for groundwater is increasing.

The Smart Growth law sets forth nine elements that each community must develop in its comprehensive land-use plan.[73] Under the agricultural, natural and cultural resources element of the law, groundwater, along with surface water, is addressed as a resource that should be included in a local community's "compilation of objectives, policies, goals, maps and programs."[74] However, because the law was not intended to prescribe specific plans and policies for local communities, the communities themselves must determine through their planning process what their groundwater issues are and how to address them.[75]

Although Smart Growth does not specifically require communities to prepare and submit groundwater management plans, Smart Growth planning funds can be used for groundwater planning. Groundwater management plans, if properly conducted, are premised on groundwater studies and, optimally, principles of groundwater budgeting. The hydrogeologic assessment of a community's groundwater provides answers to a number of critical questions including: the availability of water in the community's underlying aquifers; the recharge rate of the aquifers; the aquifer's recharge areas; and the effect that new development could have on the community's water supply. Especially in those areas experiencing declining aquifer levels and problems with water quality, these considerations are imperative to sound future development and land use decisions.

While the costs of the necessary groundwater studies and modeling are not insignificant, the benefits in terms of long-term, sustainable economic development make it a worthwhile investment.[76] One way to prioritize where to spend scarce resources would be to require this degree of in-depth planning in communities that are currently experiencing, or at risk of experiencing, water quality or quantity problems.

CASE STUDY: Township of Richfield, Wisconsin: Protecting Groundwater Recharge

An example of a community where groundwater studies have led to an appreciation of the groundwater resource and a movement towards a water budget approach is the Washington County Township of Richfield. Researchers from the University of Wisconsin-Milwaukee, headed by Doug Cherkauer, Ph.D., Professor of Hydrogeology, received a state grant to conduct a two-year study of groundwater resources in Richfield to aid town officials in planning for future development.[79] At the study's outset, town officials sought up to 40 homeowners to volunteer the use of their wells.[80]

Cherkauer's study has addressed, among other findings, the change in the groundwater table due to increased pumping and the means to identify the visual surface location of the community's primary groundwater recharge area.[81] Richfield town planners have used the information obtained from this groundwater study to develop a groundwater management plan that is not only protective of their community's groundwater recharge areas but that provides for the return of the town's wastewater to the underlying aquifer.[82]

Moreover, a number of neighboring communities can pool their resources together to finance a groundwater management plan for their area, in the manner recommended under Smart Growth with regard to multi-jurisdictional comprehensive plans.[77] With improved information and resource support, local governments would be in a better position to protect vital areas like groundwater recharge zones, wetlands and floodplains through zoning laws, conservation plans and development guidelines.[78]

Thus, while Smart Growth represents an important step towards curtailing unplanned and haphazard development, it is up to communities to utilize the law effectively to prepare an integrated water resources management plan and a land use plan that are in harmony with the local water supply. By taking the initiative in this manner and acknowledging the key relationship between land use decisions and ground and surface water quantity and quality issues, Wisconsin communities can plan for and move toward an environmentally sustainable future.

POLICY RECOMMENDATION:

- **Wisconsin land use laws and annexation policies need to be amended and/or enacted to proactively protect water supplies, including groundwater recharge zones, and to facilitate water supply planning at both the local and state level.**
- **Local communities need to ask regional planning commissions, UW extension representatives, and others involved in assisting local planning efforts to provide the hydrogeologic studies and technical assistance necessary to effectuate groundwater management planning and implementation.**
- **Local communities should utilize Smart Growth planning efforts and funding to produce comprehensive groundwater and related water resources management and land use plans.**

Gaps and Opportunities for Conservation in Water Utility Rates

Overview of Utility Rate Structures

The Wisconsin Public Service Commission (PSC) has the authority to set the rate structures for water utilities.[83] Water utilities are municipal water systems that provide fresh water to residential and industrial customers in its service area.

In the U.S. there are five ways that utilities structure the rates they charge their customers, with each structure providing different incentives or disincentives for water conservation: Flat rate, Uniform rate, Declining Block Rate, Increasing Block Rate, and Seasonal Rates.[84]

The Wisconsin PSC has selected the declining block rate as its statewide pricing structure.[85] As the name suggests, a declining or decreasing block rate provides a volume discount to water users. In other words, the more you use, the less you pay per unit used. The initial usage is charged at the highest rate.[86] Thus, under the declining block rate pricing structure, there is a financial disincentive to conserve water because the price of water decreases as consumption increases.[87]

The rationale commonly provided for the utilization of a declining block rate is that "unit costs decrease with increased usage."[88] In theory, a utility's efficiency increases when greater demand is placed upon their systems.[89] Where increased uses cost less for the utilities to operate, these savings are passed on to the consumers. From the perspective of the utilities, it follows that reduced usage, a goal of water conservation, translates into reduced revenue streams and potential fiscal problems. While a declining block rate is therefore beneficial to commercial and industrial users who use large amounts of water, the clear problem with this structure from a conservation perspective is that it promotes maximal amounts of water usage.[90]

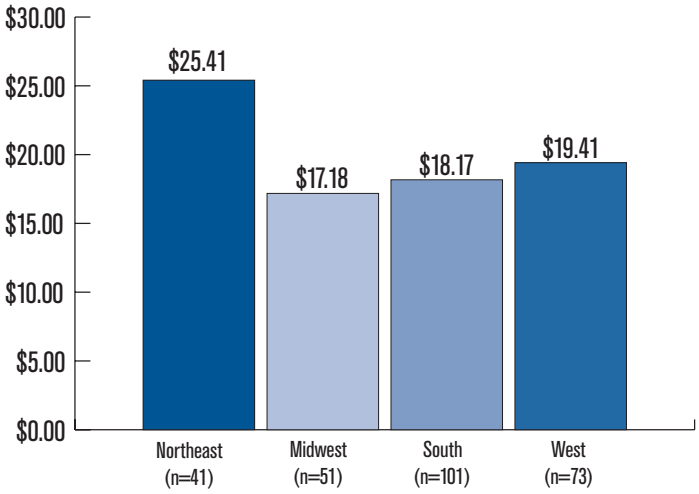
Municipalities throughout Wisconsin are given the authority to own and operate public utilities. Any town, village or city can own and operate a public utility, pursuant to the limitations created by the Wisconsin Statutes in Chapter 196.[91] Municipal public utilities are utilities owned and operated by a city, village or town that conduct their public service functions, not in a governmental capacity, but in a proprietary capacity.[92] As such, municipalities operate their water utilities as

business entities and thus have the power to determine their own prices for water utility services.[93] The revenue that a utility generates is designed to support the costs associated with the operation of the utility. Thus, so long as the prices established are consistent with the rate structure established by the PSC, each municipal public utility may set its own water prices.[94]

It is noteworthy given the PSC's critical role in determining the rate structure for the state and in overseeing public utilities' price setting process, how little attention is given to water conservation. None of the PSC webpages promote conservation measures through, for example, a list of suggestions and guidelines for homeowners to help them decrease water consumption. There appears to be no discussion even of the rationale behind the PSC's selection of the declining block rate structure over other more conservation-oriented structures. The PSC is virtually silent on the topic of water conservation.

As demonstrated in the chart below depicting median water rates based upon a recent survey conducted by the American Water Works Association, as a region, Midwestern states tend to price their water lower than the prices set by other areas of the county.[95]

US Water Median Monthly Rate by Region (7,750 gallons)



Adopted from Water and Wastewater Rate Survey, American Water Works Association and Raftelis Financial Consultants, Inc., pages 94, 103 (2004).

The survey results also indicate that the average monthly price of water in the state ($16.56 monthly based upon 7,750 gallons of use) is significantly lower than the national average ($19.85 monthly based up 7,750 gallons of use).[96]

U.S. WATER UTILITY RATE STRUCTURES

RATE STRUCTURES	RATE FEATURE	CONSERVATION IMPACT
Flat Rate	Charges the user a fixed price regardless of the amount of water used.	Least effective in encouraging water usage reduction.
Uniform Rate	Charges the user the same unit rate for all water usage.	Minimally effective in encouraging water usage reduction.
Declining Block Rate	Charges the user less as usage increases.	Discourages efficient water use for large water users.
Increasing Block Rate	Charges the user more as usage increases.	Rewards efficient water usage.
Seasonal Block Rates Differentiated seasonal Summer seasonal	Charges users a higher rate for water used during the summer. Surcharge directed only to users whose peak season use exceeds average use during off-peak season.	Encourages water users to be efficient by reducing uses during peak season.

There is also a large variation in water rates charged within the State of Wisconsin. A selected Comparison of Net Quarterly Water Bills in Wisconsin is found below.

SELECTED COMPARISON OF NET QUARTERLY WATER BILLS IN WISCONSIN PER 18,750 GALLONS[97]	
Milwaukee Water Works	$30.16, $40.20, $50.26[98]
City of Fitchburg Utility District	$41.67
City of Waukesha Water Utility	$43.31
New Berlin Water Utility	$59.44
Fond Du Lac Water Utility	$73.75
City of Oshkosh Water Utility	$84.41
Appleton Water Department	$90.25
Port Washington Municipal Water Utility	$92.50
Ashland Water Utility	$98.75
Superior Water Light and Power Company	$103.85
Wisconsin Gas	$116.63[99]
Average[100]	$54.41

Wisconsin PSC's reliance on a declining block rate structure to set water rates throughout the state, together with the PSC's silence on conservation, are impediments to conservation.[101] Economic studies indicate that water prices influence water conservation behavior.[102] Rate structures that charge for the amount of water used and/or charge a higher rate for consumption above a certain level encourage people to use water on a more efficient basis notwithstanding the effect of price elasticities for utilities.[103] Given this reality and Wisconsin's increasing water concerns in highly populated parts of the state, the PSC would be wise to take a closer look at the state's present rate structure and adopt alternatives that favor water conservation.

Towards this end, as part of the state's Conserve Wisconsin Initiative, the PSC, in conjunction with the DNR, is planning over the course of the coming year to initiate a study to evaluate demand-side alternatives to the state's current utility rate structure.[104] The PSC's commitment to this endeavor is timely and important, as amply demonstrated by the following fact scenario involving the Waukesha Water Utility.

As part of its 2005 rate case, the Waukesha Water Utility sought the PSC's approval of a change from the operative declining rate structure to either an inclining rate or a flat rate in consideration of Waukesha's current water supply concerns. The PSC's response? For all intents and purposes, "no." As communicated by the PSC, if the Utility wanted to proceed with a rate change request, its rate case would be delayed a minimum of six to eight months.[105] In discouraging the utility's request, the PSC further stated, "Not to say that a holistic approach to conservation is not warranted in areas like Waukesha but rate structure is generally not the silver bullet many consider it."[106]

The PSC should proceed mindful of the lessons learned in other states that water rate structures work best as a conservation tool when coupled with a sustained customer education program.[107] Indeed, due to the common perception that water is "free," people need to understand that water charges pay for all the costs of water service – including finding and building new water sources – before people will be willing to consider higher water rates and water conservation measures.[108]

THE DELAWARE LEAD

In January of 2005, the State of Delaware implemented, under a statewide contract with United Water, a new rate structure with the express aim to reward residential customers who conserve water.[109] The pricing structure adopted is an inclining block rate. While there remain flat rates for items such as fire protection and service charges and the rate system is designed to be revenue neutral, the unit price of water increases as consumption increases. For example, after a resident consumes over 5,000 gallons, the price per 1,000 gallons increases from $2.48 to $2.64. If a resident consumes over 20,000 gallons, the price rate per 1,000 gallons increases again to $3.07.

This new conservation pricing was adopted in conjunction with the conservation outreach efforts of the Delaware River Basin Commission, which includes Delaware, New York, New Jersey and Pennsylvania. These states have faced water quantity problems comparable to those faced currently by Southeastern Wisconsin.[110]

POLICY RECOMMENDATION:

- **The PSC should produce a uniform rule applying an increasing block rate across Wisconsin. An increasing block rate raises the price per unit of water as the amount of water consumption rises. Water use then could be accurately priced to motivate water conservation measures that limit consumption and promote water reuse.**

Opt Out Alternative for Large-Scale Users

Yet another potential impediment to conservation is Wisconsin's failure to provide a statewide prohibition on large-scale users "opting out" of available municipal water supply. Indeed, if a large industrial water user were to determine that the municipal utility's water pricing or proposed conservation measures were undesirable from a corporate perspective, the facility, under Wisconsin law, could opt out of the municipal system and drill a high capacity well of its own provided that it meets existing statutory requirements. This scenario would result in a smaller pool of utility customers for the same fixed operating costs, thereby creating fiscal difficulties for the municipal water utility.

CASE STUDY: Mandatory Connection in the City of New Berlin, Wisconsin

The City of New Berlin's "mandatory connection" provision offers an instructive alternative to allowing large scale water users to opt out of a water utility. Under the City's Municipal Code, "the construction or deepening of private wells is prohibited on any premises to which municipal water service is available."[113] In other words, residents or owners of premises are required to connect to the municipal water system once available. Thus, New Berlin's industrial sector, upwards of 98% of whom are on the city's municipal water system, cannot opt out in the manner discussed above and must remain bound to the municipality's rates and conservation measures.[114]

While it remains unclear to what extent large-scale users are opting out of municipal systems, the opportunity afforded large-scale users under state law to opt out of available municipal water systems may serve, in effect, to deter municipal utilities from initiating conservation pricing and undermining implementation of system-wide water conservation initiatives.[111]

In recent correspondence between the PSC and the Waukesha Water Utility, the PSC relied on the "opt out-death spiral" rationale to discourage the utility's request for approval of a conservation rate structure in Waukesha:

> Often in a water rich state like WI true conservation rate structures result in…water utilities losing industrial customers who may have other options, which then simply fuels the rated death spiral for the customers who remain.[112]

In view of this, state legislation and/or regulations should be enacted to prohibit large-scale water users from opting out of available public water utility systems.

POLICY RECOMMENDATION:

- **The PSC or the Groundwater Advisory Committee should offer statutory and regulatory recommendations to preclude large scale water users from opting out of available public water utility systems.**
- **Local governments should follow New Berlin's lead and pass mandatory connection provisions as part of their implementation of water conservation measures.**

GAPS AND OPPORTUNITIES FOR REGIONAL COOPERATION

Because water resources extend well beyond local political boundaries, a coordinated effort between local governmental bodies and other regional stakeholders is crucial to the protection of water resources and the management of the region's human, economic and environmental needs. Yet, due to local protectionism and competition for development and growth, inter-governmental cooperation is most often an elusive goal. Moreover, under Wisconsin's system of local government, local municipalities have very limited ability to enact laws or devise policies affecting land-use or groundwater conservation in another municipality, even if the communities share common boundaries.[115] This problem is further exacerbated by the Wisconsin PSC's delegation of price setting authority to 588 local municipal water utilities across the state, resulting in a lack of uniformity and widespread variations in water prices and philosophies towards usage.[116]

Nonetheless, opportunities to achieve a regional approach to water resource management and conservation do exist. One such example concerns the Kettle Moraine area of western Waukesha County. For decades, it has been known that the deep aquifer of Southeastern Wisconsin is replenished by the precipitation that falls in the Kettle Moraine area of western Waukesha County as it filters into the soil and flows eastward.[117] More recent regional planning studies have verified that the soils of western Waukesha County are more permeable than the soils to the east.[118] As a result, the rain and snow falling in this area of Waukesha County serve to replenish not only the deep sandstone aquifer but the shallow aquifer as well. In fact, preliminary studies indicate that, here, replenishment of the shallow aquifer is quite effective, nearly equaling the amount of water pumped out.[119]

Regional planners, hydrogeologists and environmental activists alike recognize that unwise development in the western part of Waukesha County would place both the deep and the shallow aquifers of Southeastern Wisconsin in jeopardy. Given these findings, it is logical that proactive measures need to be undertaken to protect western Waukesha County's Kettle Moraine area. Yet, the question remains how, given Wisconsin's system of local government in which the local municipalities in eastern Waukesha County lack the power to enact laws regarding development in the western part of the county even if their communities would experience the greatest fall-out from such development.

The answer can be found in communication, resolve and cooperation. Indeed, the momentum to protect the Kettle Moraine is already well underway. Through exhaustive effort and with state government support, the Kettle Moraine Task Force of the Wisconsin Academy of Sciences, Arts and Letters and the Wisconsin DNR[120] have brought together a variety of local municipalities, state governmental bodies, land trusts and citizen organizations working towards the goal of closing the forty mile-gap that still remains between the north and south units of the Kettle Moraine state forest.[121] Efforts continue, with local land trusts buying up land where possible and committed groups like the Kettle Moraine Task Force, the DNR and 1000 Friends of Wisconsin continuing to meet with local government leaders and realtors to explain the conservation goals for the area and to encourage them to incorporate these objectives into their local comprehensive plans.[122] [123]

Moreover, another approach to building cooperation that has proven effective in other contexts is the development of networked arrangements between inter-local parties in a manner that binds actors to a course of action and thereby precludes unilateral action by any one participant.[124] Consistent with this approach, an effort could be made to empower an existing state or regional entity, such as the DNR, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) or the newly appointed Groundwater Advisory Committee, to map out a comprehensive water resource management plan for Southeastern Wisconsin or, more specifically, for either of the state's two Groundwater Management Areas.

If provided with the necessary legislative authority, SEWRPC,[125] for example, could be charged with overseeing the development, implementation and monitoring of a contractually-binding water resource plan that considers the steps outlined in the Table above.[126] Through this planning process, local governments and private community members could thereby be afforded the opportunity to work out solutions to local problems. This would provide an adaptive plan containing meaningful and binding direction on issues ranging from land use to groundwater recharge to water rates, all of which are vital to the protection of the region's water resources.

STEPS TO ADOPT A BINDING GROUNDWATER MANAGEMENT PLAN

Step One	Identify stakeholders with long-range interests in the ground and surface waters of an area
Step Two	Develop Comprehensive Groundwater Plan for Region through adherence to a planning process that is both transparent and open to public participation
Step Three	Review and Approval process by which stakeholders sign onto the groundwater plan in a contractual manner
Step Four	Design and implement a dispute resolution process
Step Five	Stakeholders stay the course using an adaptive approach and continued monitoring, reporting, and financial support.

POLICY RECOMMENDATION:

- **Regional cooperation efforts should be supported and pursued at the state and local level to facilitate developing, implementing and monitoring a contractually-binding regional water resource plan, which can provide direction on issues ranging from land use to water rates to groundwater recharge protection.**

Section I Summary

As the analysis of Wisconsin's incentives and disincentives to conservation demonstrates, current state laws and economic structures effectively impede water conservation objectives on both a local and a statewide basis. Also shown above, ample opportunities exist from a regulatory and legal perspective to move Wisconsin towards a more effective conservation model. In the next section, we will explore additional water conservation opportunities for Wisconsin by examining best management practices utilized by other municipalities and states with the aim of creating a water conservation toolkit of value to Wisconsin communities.

SECTION II: DEVELOPING A SUCCESSFUL CONSERVATION PROGRAM FOR WISCONSIN

Compared to other states in the Southern and Western United States, Wisconsin is water rich. Some areas of Wisconsin, however, are already facing challenges to their water supplies, including drawdown of groundwater aquifers and problems with water quality. In other communities, water demands are quickly exceeding available supplies.

In order to ensure that water supplies continue to meet ever increasing water demands, Wisconsin must act before it is too late to conserve and protect its waters. As the previous section indicates, a number of opportunities exist to strengthen and reform Wisconsin's existing legal framework and bring water conservation to the forefront of political discourse in Wisconsin.

Although not mandated by law, communities and policy makers at all levels of government can and should act now to address water conservation through the development of comprehensive water conservation plans. These conservation plans can help communities achieve sustainable water management profiles where projected water use does not exceed available supply and ensure that Wisconsin has adequate water supplies to allow for future economic and population growth.

Conservation plans are typically comprised of a variety of best management practices, which entail conservation measures or incentives that have proven to be cost-effective and water efficient.

Choosing the best management practices to form the backbone of a successful conservation plan is a task that may seem daunting for policy-makers given the wide variety of conservation measures and incentives from which to choose. To inform discussion and assist those involved in water conservation, this section provides a sample conservation toolkit containing 12 best management practices.

As the following discussion will illustrate, there is no such thing as a one-size-fits-all conservation plan. Communities need to tailor their conservation plans to their own population's needs, norms and values. That said, certain best management practices tend to lend themselves more readily to local and statewide initiatives in Wisconsin – these measures and initiatives form the basis of our toolkit and will hopefully provide a starting point for communities in creating their own conservation programs tailored to their needs.

Outlined below is the three-step process used to develop our toolkit. Step One discusses the need to create water-use profiles. It examines water use in Wisconsin, using Waukesha County as an example, to gain a better understanding of how this information can help inform the selection of best management practices. Step Two explores various best management practices and water conservation programs currently implemented in other states – programs that can be used as models for water conservation in Wisconsin. Step Three involves selection among these best management practices.

Step One: Developing a Water-Use Profile

An important first step in developing a successful conservation program at the local and state level is to develop a water-use profile. A water-use profile should ultimately serve two main functions: first, it should provide a realistic sense of a community's water supply and future water needs; and, second, it should detail

where, when and how water is being used. Understanding both the historic and projected water supplies and demands can help communities develop water budgets and set realistic conservation goals to help balance these budgets. Likewise, understanding how water is being used, and in what quantities, can help decision-makers select conservation measures and incentives that will prove most effective.

Our goal is to assist Wisconsin policymakers and stakeholders with the development of a successful conservation program with measurable results. As such, the discussion below focuses on the second objective of water-use profiles, understanding water use patterns, by examining water use in Wisconsin and Waukesha County. This discussion is not intended to provide a comprehensive analysis of water use in these areas or to suggest that use patterns should be the only relevant factor utilized in selecting conservation measures, but rather to demonstrate how understanding use patterns can aid in the development of effective conservation programs tailored to a given community's specific needs.

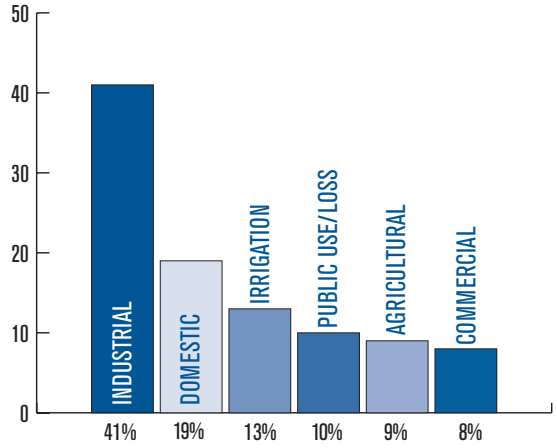
In 2000, Wisconsin residents withdrew approximately 7,594 million gallons of water a day from surface and groundwater sources.[127] Of this amount, 79% (6,094 million gallons) was withdrawn almost exclusively from surface waters for use in thermoelectric power production.[128] According to the U.S. Geological Survey, withdrawals for thermoelectric use in Wisconsin in 2000 constituted over 4 times the amount of water withdrawn for all other uses combined.[129]

The majority of water used for thermoelectric power generation is for cooling purposes. In Wisconsin, approximately 99% of this water is returned to the natural system, ultimately becoming available for other uses.[130] However, even consumptive use as low as 1% of total withdrawals can lead to staggering water use numbers when large volumes of water are involved.[131] As such, conservation measures targeting thermoelectric uses will be discussed later in this report.

It is noteworthy, that over 65% of Wisconsin's 72 counties, including Waukesha County, did not withdraw any surface or groundwater in 2000 for thermoelectric purposes.[132] Further, thermoelectric water withdrawals in two counties, Milwaukee and Manitowoc, comprised over 50% of the state's total water withdrawals for use in thermoelectric power production in 2000[133] As such, and for ease in comparing water use figures statewide to those in Waukesha County, the following water use diagrams and ensuing discussion exclude thermoelectric water withdrawals.

According to the most recent national water use data released by the U.S. Geological Survey, water use in Wisconsin, excluding thermoelectric power use,[134] broke down as follows:[135]

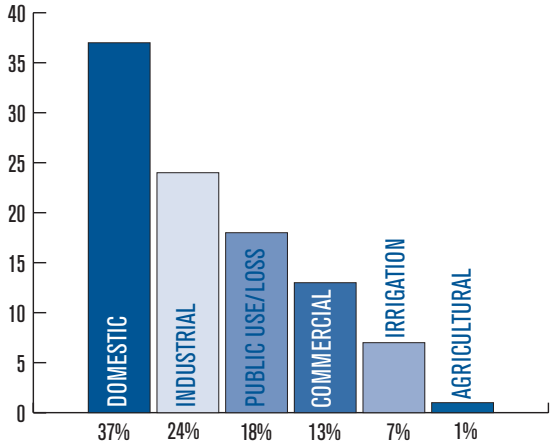
WISCONSIN WATER USE 2000 (Mgal/day)



To put things into perspective, estimates indicate that residents of Southeastern Wisconsin withdrew approximately 100 gallons of water per person per day from groundwater sources in 2000.[136]

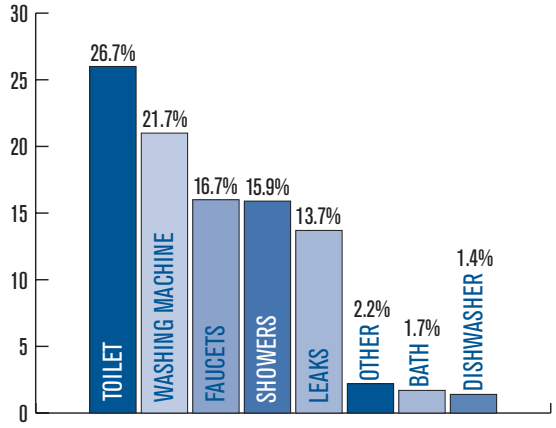
The above water use figures suggest that considerable statewide water savings may be realized by targeting industrial and domestic users and by focusing on irrigation practices. It is important to recognize, however, that the largest categories of water consumption at the state level may vary from the largest water users at the local level. For example, as the use figures for Waukesha County in 2000 indicate, domestic water use comprised the largest water use group in the county followed by industry and public use and losses.[137]

WAUKESHA COUNTY WATER USE 2000 (Mgal/day)



National figures indicate that 69% of residential water use occurs indoors with the remaining 31% being used outdoors.[138] However, given Wisconsin's shorter and cooler summers, it is likely that indoor use in the state comprises an even higher percentage of total domestic water use than the national average. Water use in the home typically breaks down as indicated below.[139]

TYPICAL INDOOR RESIDENTIAL WATER



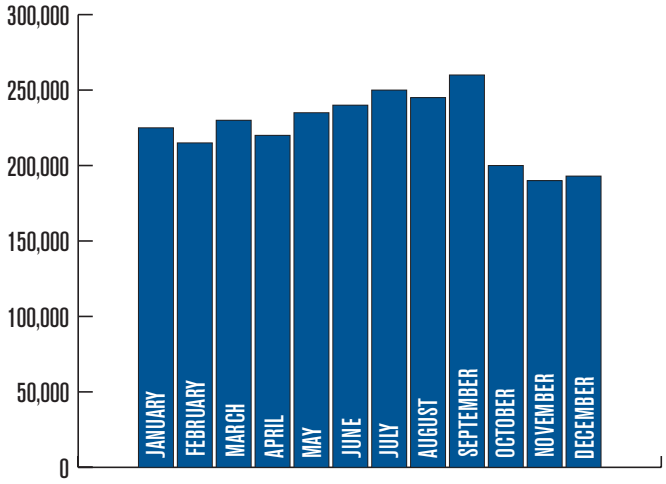
The above suggests that conservation measures aimed at reducing residential water use, particularly in the bathroom, which accounts for more than half of all indoor water use, have the potential to lead to considerable savings.

Domestic water savings can also be realized through water conservation programs targeting residential outdoor use. Most outdoor water use occurs in the summer months and the increases in water use during this concentrated period of time can place a seasonal strain on groundwater supplies.

As indicated in the graph of the City of Waukesha Water Utility's monthly water pumpage in 2004, the utility withdrew the most groundwater in September, August and July, respectively.[140]

CITY OF WAUKESHA WATER UTILITY MONTHLY PUMPAGE 2004

(GROUND WATER THOUSANDS OF GALLONS)



In addition to knowing the quantity of water used, understanding when water is being used can also aid decision makers in choosing among various conservation measures. Communities experiencing significantly higher water use during the summer months may want to include conservation measures and incentives targeting outdoor water use in their conservation programs.

Further, industrial water use accounted for a large portion of water use in Wisconsin and Waukesha County – 41% and 24%, respectively. Industrial use was the single largest use category in Wisconsin and the second largest use category in Waukesha County. Commercial use constituted 8% and 13%, respectively, of all water use in Wisconsin and Waukesha County in 2000 – comprising the fourth largest use category in Waukesha County and the lowest (sixth) use category in Wisconsin.[141]

This suggests that conservation measures aimed at industrial users, rather than commercial ones, may generate greater water savings. However, as discussed earlier, conservation measures on a local, as opposed to state level may need to be even further tailored. The City of Waukesha Water Utility's 2004 Annual Report, for example, indicates that the utility sold almost twice the volume of water to its commercial as opposed to industrial customers.[142]

When examining water use by user category, it is noteworthy that industrial and commercial customers account for significantly greater water usage per site as compared to residential customers. As a result, greater water savings are often realized on a per customer basis when targeting these customers as opposed to residential customers.

Examination of water use by customers of the City of Waukesha Water Utility illustrates this point. Average water use per customer in 2004 was 70,000 gallons for residential customers, 399,000 gallons for commercial customers and over three million gallons for industrial customers.[143] [144] Additionally, unlike residential use, which is fairly consistent, commercial and industrial use typically varies widely among customers. This suggests that when implementing conservation measures targeting industrial and commercial users, significant initial results can be achieved by focusing on the highest water users in each of these use categories.[145]

Water use for irrigation purposes comprised 13% and 7% of total water use in Wisconsin and Waukesha County, respectively. While these figures are relatively low, it is important to note that Portage, Adams and Waushara Counties reported the highest water uses for irrigation purposes in the state in 2000 and collectively comprised over half of the daily water use for irrigation purposes statewide.[146] Irrigation based conservation initiatives targeting these three counties will likely yield considerable results.

Finally, water use for public uses and losses is worth noting. The public use and loss category refers to uses not specifically categorized, such as water use in some public parks, schools, buildings, water used for fire control, main flushing and water lost from broken water mains and from transfer and distribution systems.[147] In examining ways in which to reduce water consumption in this category, it is important to examine the percentage of unaccounted for losses in water systems. Unaccounted for losses can vary from a small percentage to over 70% of a system's total water pumpage.[148] Water utilities reporting high unaccounted for losses can save considerable amounts of water by instituting leak detection and repair programs. The City of Waukesha Water Utility currently has a low unaccounted for loss figure, reporting unaccounted for losses of 6% in 2004.[149]

Step Two: Identifying, Evaluating and Assessing Conservation Measures and Incentives

Once decision-makers understand their community's water use profile and develop conservation goals that set out the numeric water use reduction for which they are aiming, the next step in developing a conservation program is to identify, evaluate and assess the existing myriad of conservation measures and incentives. Conservation measures come in many different forms and vary considerably in cost and ease of implementation. A compilation of national examples of water conservation measures and incentives can found at Appendix A of this Report.

To guide decision-makers in this evaluation process, the following is a discussion of various water conservation measures and incentives, broken down by user group, as well as examples of best-management practices implemented by states and communities throughout the county. It is not surprising that many of these highlighted best management practices have been implemented in arid and drought-afflicted areas of the county. However, most, if not all, of these best management practices are readily transferable to Wisconsin and we need not wait for a water crisis to begin to implement them. Additionally, conservation programs in place in more humid regions including Waterloo, Ontario, and Seattle, Washington, are discussed and provide excellent models for the development of conservation programs in Wisconsin.

Again, it is important to note that the discussion is not intended to provide a comprehensive listing of existing best management practices or to provide a comprehensive analysis of conservation programs currently in place, but rather to serve as a starting point for decision-makers. Volumes of information are readily available detailing water conservation measures and achievable water savings and we have provided contact information where appropriate to allow readers to follow up on conservation programs highlighted in this section.

Before proceeding with the following discussion of water demand management strategies, it is important to recognize that water demand is inconsistent – it can, and often does, vary dramatically throughout any given twenty-four hour period and from one season to the next. Water distribution systems must be designed so they can accommodate peak demand. It is estimated that water treatment plants and storage facilities are often built as much as four times larger than the average daily demand on the system in order to accommodate these peak

periods.[150] During peak periods, which often occur in the summer months, water systems may not be able to maintain adequate water pressure for basic drinking and residential functions, provide water to tall buildings, or provide water to fight fires.[151] Reducing peak water demands can help reduce pressure on water systems and defer capital expenditures for expensive plant expansions. Thus, in addition to reducing overall water demand, comprehensive conservation plans should also aim to reduce peak usage, through selection of certain best-management practices, particularly those aimed at reducing outdoor water use in the summer months and at reducing industrial and commercial water use.

Traditional Best Management Practices for Water Conservation

Traditional and commonly accepted methods of water conservation focus on best management practices that aim to reduce human consumption and water demand. A list of various best management practices implemented in other communities can be found in Appendix A. These best management practices typically take two forms – conservation measures and conservation incentives. Conservation measures are discussed in detail below and can be further characterized as hardware/technical measures or behavioral measures. Incentives address how to motivate people to implement a particular conservation measure and are typically educational, financial or regulatory.[152]

Examples of various conservation incentives include:[153]

EDUCATIONAL	FINANCIAL	REGULATORY
▪ School Curriculum ▪ Bill Inserts ▪ TV & Radio Ads ▪ Demonstrations ▪ Training Programs ▪ Conservation Checklists	▪ Rebates ▪ Conservation Rate Structures ▪ Incentive/Surcharge Fees ▪ Bill Credits ▪ Metering	▪ Water-Efficiency Ordinances ▪ Laws and Plumbing Codes for Water Efficient Fixtures/Appliances ▪ Landscape Standards ▪ Irrigation Scheduling ▪ Penalties for Outdoor Water Waste

Public Education

It is important to note that public education is an essential element to any conservation program. Public education is often not part of discussions of water conservation measures for two reasons: first, it is virtually impossible to quantify resulting water savings and, second, there are hundreds of different educational tools available. One of the main obstacles to implementing water conservation programs, however, is public perception that water is plentiful.

A recent survey conducted by the Great Lakes Commission on current water conservation practices of the Great Lakes – St. Lawrence Region found that the majority of municipal water supply facilities that do not have formal conservation plans in place cited perception of adequate water supply as the reason.[154] Public education can begin to alter behavioral patterns and can help residents understand the extent and limits of the area's water resources. Armed with this knowledge, the public can and may press policymakers to enact and to implement more stringent regulations to protect one of Wisconsin's most valuable resources.

Reducing Residential Water Use

Significant water savings can be realized by targeting residential water use. Some of the most common conservation measures used in the home include replacing water guzzling toilets, faucets and showerheads with low-volume counterparts or through the installation of retrofit devices. Unlike behavioral measures that require continual reinforcement, technical measures produce water savings long after they are initiated and only require a one-time commitment on the part of consumers. Other technical measures include faucet, toilet and shower leak detection and repair and replacing dishwashers and washing machines with more water efficient models. A list of the above-mentioned residential and domestic water efficiency hardware measures and the potential water savings they can achieve are located in Appendix C to this Report.

Behavioral water efficiency measures are also important and can include turning off faucets when they are not in use and when brushing teeth and shaving, washing only full loads of laundry and dishes, taking shorter showers and refraining from using the toilet as a trash can.[155]

CASE STUDY: Waterloo, Ontario's Water Conservation Program

The Regional Municipality of Waterloo, Ontario ("RMOW"), has developed a comprehensive water conservation program that focuses primarily on reducing both indoor and outdoor residential water consumption. This program can serve as a model for the development of residential conservation programs statewide and locally in Wisconsin particularly given similar climactic conditions.

The RMOW is in southwestern Ontario in the center of a triangle formed by Lakes Ontario, Erie and Huron and is part of the Grant River Watershed. Approximately 450,000 people reside in the RMOW, and it is one of the fastest growing areas in the province.[159] RMOW obtains 75% of its water from groundwater, with the remaining 25% being drawn from the Grand River.[160] The Grand River watershed covers 2,600 square miles, and approximately 80% of the watershed's recharge occurs in 30% of this area. The population of the Grand River Watershed, which includes RMOW, is projected to grow by 37% in the next twenty years. Drought conditions and increases in population have meant that the region's water system is operating at near capacity.[161]

The RMOW has promoted water conservation programs, including toilet rebate and retrofit programs, since 1974.[162] In 1998, the Regional Council approved the Water Efficiency Master Plan, which establishes the goal of reducing water consumption by 1.5 million gallons of water per day by 2009. In 2000, the Regional Council also approved the region's Long Term Water Strategy, which outlined how the region will provide water and infrastructure to the growing community through 2041 (including groundwater extraction, aquifer storage and recovery and construction of a pipeline to Lake Huron or Lake Erie). In response to the Long Term Strategy, the public recommended that the region do more to promote water efficiency and to try to defer capital costs.[163]

Conservation measures developed through the Water Efficiency Master Plan include:[164]

- Residential Toilet Replacement Program – rebates of $40 per 1.5 gpf toilet and $60 per 1.5/1.0 gpf duel flush toilet.
- Intensive Toilet Replacement and Water Efficiency Program (targeting Ayr, Ontario) – $200 rebate for 1.5 gpf toilet replaced, home consultations and free shower heads and tap aerators.
- Rain Barrel Distribution Program – 25,000 rain barrels to be distributed at a subsidized cost of $20 over five years.
- Curriculum Supplement for grades K–6 and 9–12 – includes 200-page teacher manuals, videos, posters, a CD Rom and other support materials.
- Promotion of Water Efficient Washing Machines Through Public Education.
- Efficient Region Facilities – continued application of water efficient devices and practices in regional facilities including retrofitting, leak detection and low-water landscaping.
- Public Awareness Campaigns – including public events and presentations, demonstration gardens, brochures, Environews newsletter, children's museum exhibit and advertising.
- Industrial/Commercial/Institutional Customer Initiatives – focus on educating businesses and providing support for them to initiate water savings processes and activities.
- Outdoor Water Use By-Law Update & Promotion – restrictions on outdoor water use in varying stages depending on the severity of water conditions.

The Master Plan provides cumulative efficiency targets for each program on an annual basis. Water savings for 2003 were 3,997.23 cubic meters a day (approximately 1.06 million gallons per day), 142.44 cubic meters (approximately 37,468 gallons per day) above the annual target.[165]

The RMOW believes that the Master Plan continues to be an effective conservation tool. However, in order to continue to ensure that its water efficiency program is as effective as possible, the Water Efficiency Advisory Committee agreed to review and update the Master Plan program beginning in 2005.[166]

Water savings can also be realized through water conservation programs targeting residential outdoor use. As discussed earlier, due to the seasonal nature of outdoor water use, reductions in this area can significantly impact peak water usage. Frequent sources of outdoor water waste include poor irrigation practices – watering too much and for too long, watering pavement areas, and the use of inefficient equipment.

Examples of methods used to regulate landscape irrigation include:[156]

- Ordinances requiring the use of soaker hoses instead of sprinklers to irrigate turf areas and narrow strips of landscape;
- Ordinances requiring rain shut-off devices, which override sprinkler timers when rainfall is adequate for irrigation purposes;
- Ordinances requiring efficient irrigation systems for new landscaping;
- Prohibitions on wasteful use;
- Ordinances requiring non-potable water and/or efficient irrigation systems for golf-courses;
- Use of graywater for landscape irrigation (including golf courses);
- Recommended or mandated watering schedules and/or times for watering during declared water shortages.

Outdoor water use can also be reduced through programs emphasizing the use of native or low-water use plants (often called Xeriscaping, water-wise or natural landscaping). A study conducted in Austin, Texas indicated that residential properties using Xeriscape principles on lots smaller than 9,000 square feet used on average 43% less water than properties landscaped using conventional means.[157] Water savings resulting from planting low-water or native plants will vary based on what is replaced, what plants are used and how much supplemental irrigation is still required; however, studies suggest that at least a 20% reduction in water should be expected from these programs.[158] To date, xeriscape programs have been concentrated in arid states or states experiencing seasonal water shortages. As such, these programs may have more limited application in Wisconsin with its shorter summers and more humid climate.

Reducing Industrial Water Use

As discussed above, conservation practices targeting Industrial, Commercial and Institutional ("ICI") water use can lead to considerable water savings per targeted ICI customer. While residential customers typically use water in similar ways, ICI Customers use water for vastly different purposes – manufacturing, running a hospital or health care facility, schools and restaurants. Conservation measures that produce results in one facility may have a minimal impact in others. On-site water audits can provide the most accurate assessment of water efficiency in any given facility and can produce custom tailored water conservation strategies. [167] In addition to these water audits, or where individualized water audits are not practical, conservation rate structures can also help reduce water consumption among ICI Customers, including peak water usage.

A 2000 study of ICI water use and conservation indicates that potential water savings from ICI conservation measures range from 15% to 50%, with 15% to 35% being typical.[168] Amounts spent on ICI conservation plans are typically recouped by ICI customers, through reductions in water and energy costs, between one to four years, with most paybacks occurring in less than 2.5 years.[169]

Reducing Agricultural Water Use

In the agricultural realm, inefficient irrigation technology and practices are major sources of water waste. There are three basic types of irrigation systems in use throughout the country: surface (gravity) irrigation, sprinkler irrigation and micro-irrigation.[170] According to the U.S. Geological Survey, all irrigation reported in Wisconsin in 2000 was of the "spray" type.[171] The efficiency of spray irrigation systems varies considerably and falls in the range of 60 to 98%.[172] Inefficient uses of water also result from evaporation and wind drift caused by water being applied at great heights, non-uniform application of water and malfunctioning systems.[173]

Examples of agricultural related water efficiency measures include the use of low energy precision application or drip irrigation systems, the recovery and reuse of tailwater, the lining of canals and behavioral measures such as altering irrigation patterns based on weather conditions and monitoring soil moisture.[174] As was true with ICI customers, irrigation and agricultural water use

practices differ among customers. Water audits conducted on-site can help agricultural customers understand how their water is being used and help customers develop site-specific water conservation practices. Conservation rate structures can also deter excessive water use.

Educating growers on the importance of irrigation scheduling can also lead to reductions in agricultural water waste and groundwater contamination. In Wisconsin, most irrigated soil is sandy and is close to groundwater resources. As a result, over-irrigation can lead to soil saturation and cause the leaching of nitrates and pesticides into the groundwater.[175] Additionally, over-irrigation wastes both water and energy. Irrigation scheduling helps growers determine how often and in what quantities water should be applied to their crops, thereby maximizing efficiency by applying the precise amount of required moisture. Most irrigation scheduling relies on evapotranspiration estimates to monitor soil moisture.[176] Daily estimates of evapotranspiration rates are available on line through the University of Wisconsin – Madison, Department of Soil Science, along with an excel spreadsheet to assist growers with irrigation scheduling.[177] The Wisconsin Potato & Vegetable Growers Association also provides software to its members to help with both irrigation scheduling and pest-control.[178] Through the use such scheduling, growers can take into account Wisconsin's variable rainfall patterns, thereby reducing overall water use.[179]

Reducing Thermoelectric Water Use

Typically, in thermoelectric power plants, heat is removed from the power production cycle with a condenser that relies on cooling water.[180] The two major types of cooling systems for thermoelectric power plants are once-through and closed-loop cooling systems.[181] The U.S. Geological Survey categorizes thermoelectric power use in each state by cooling system, as it is a primary determinant of the amount of consumptive use relative to withdrawals.[182]

According to the U.S. Geological Survey, almost all thermoelectric water withdrawals in Wisconsin in 2000 were used in once-through cooling systems.[183] These systems pass water withdrawn from nearby sources through heat exchanges to condense steam. Because the water does not directly contact the air, consumption through evaporation at the power plant is minimal.[184] The water, however, is returned to the natural system at a much higher temperature than when it was withdrawn. In addition to the impacts this thermal pollution can have on fragile ecosystems, the elevated temperature of the water increases evaporation, indirectly leading to increased water consumption.[185]

Recently, several power plants using closed-loop cooling systems have been constructed in Wisconsin.[186] These systems are designed to reduce the amount of water that is withdrawn from water sources. Through the use of cooling towers, cooling water is recycled between a cooling tower and a heat exchanger. During the process, water is evaporated in order to cool the cooling water. As a result, water must be withdrawn to make up for the evaporated water. Due to evaporation, closed-loop cooling systems consume much more water than once-though systems. However, these systems withdraw significantly less water from water sources, thereby reducing environmental impacts associated with the intake of large quantities of water and thermal pollution resulting from the discharge of this water at high temperatures.[187]

New technologies for reducing water withdrawals and consumption through the use of once-through cooling systems are being developed. The U.S. Department of Energy's National Energy Laboratory has initiated a research and development program to develop technologies and approaches to reduce the amount of freshwater used by power plants and to minimize potential impacts of these power plants on water quality.[188] Thermoelectric power plants in Wisconsin should be regularly updated to ensure that the most water efficient equipment is in place.

Furthermore, reductions in both water withdrawals and water consumption for purposes of thermoelectric power production are also achievable through the use of dry cooling systems.[189] In these systems, water does not come in contact with air. According to the National Renewable Energy Laboratory, "the advantage to dry cooling is the water withdrawals and consumptions are zero."[190] Unfortunately, dry cooling systems are less efficient than once-through cooling systems and have higher capital costs. However, future improvements in dry cooling technology may make these cooling systems an attractive alternative to once-through and closed-loop systems.[191]

Lastly, in addition to the use of improved technology, reductions in water withdrawals and water consumption for the purposes of power production are achievable through energy conservation and by investing in wind, solar and other renewable energy systems.[192]

CASE STUDY: Florida's Water Reuse Program

In sharp contrast to Wisconsin's regulations, which are virtually silent on water reuse, the Florida legislature has established the promotion and encouragement of water reuse and water conservation as state objectives and has stated that reuse systems designed and operated according to the Florida Department of Environmental Protection ("Florida DEP") rules are considered environmentally acceptable and are not a threat to public health and safety.[197] The legislature has promulgated very detailed statutes specifically addressing water reuse.[198]

These statutes divide Florida into five water management districts (WMDs). These WMDs are unique in that they are responsible for water supply planning and management. The WMDs implement consumptive use permitting programs and encourage and direct water users and utilities to use reclaimed water and to put reuse programs in place.[199] The WDs are also required to assess water resources in their district and to designate Water Resource Caution Areas – typically areas where traditional water supplies will not meet long-term water needs. Applicants for domestic wastewater permits in a facility located in a Water Resource Caution Area must prepare reuse feasibility studies. Utilities are then requested to implement water reuse programs to the degree feasible based on these studies.[200]

Significant cooperation exists on a statewide level. The Reuse Coordinating Committee was created in 1992 and serves as the primary means for promotion, coordination and communication of water reuse activities among the various agencies involved in the water reuse arena.[201] The Public Service Commission, which regulates rates for some of the water utilities, the Florida DEP, and the five WMD's have entered into various memoranda of understanding delineating the responsibilities of these agencies in the water reuse area.[202]

Permitting is also coordinated – Florida DEP's six District Offices coordinate with the five MWDs to permit water reuse projects in order to promote consistency between domestic wastewater treatment plant permits issued by the DEP and consumptive use permits issued by the WMDs.[203] Domestic wastewater permits must be consistent with requirements for reuse contained in consumptive use permits issued by WMDs, and consumptive use permits must be consistent with local reuse programs.[204] Additionally, the PSC is required by statute to allow utilities implementing reuse programs to recover the full cost of reuse facilities.[205]

With a mandate from the legislature, the Florida DEP has developed extensive rules governing water reuse, including a list of acceptable uses for reclaimed water, a framework for approval of uses of reclaimed water not specifically enumerated, regulations for monitoring water reclamation facilities, regulations for the designation of Water Resource Caution Areas and rules governing mandatory reuse.[206]

Florida's reuse program has achieved enormous success. Approximately 630 million gallons a day of reclaimed water in Florida were used for beneficial purposes in 2004; the majority of this use (49%) was for landscape irrigation with 16% being used for groundwater recharge.[207] The average use of reclaimed water across the state was 35.98 gallons per capita per day.[208]

Moving forward, Florida is focusing on the efficient and effective use of reclaimed water. Despite significant reuse figures, in 2004 Florida still disposed of over one billion gallons a day of wastewater effluent using deep water injection wells, ocean outfalls and other surface water discharges – water which it hopes to reclaim and reuse for beneficial purposes.[209] In its report, titled "Water Reuse for Florida: Strategies for Effective Use of Reclaimed Water," the Reuse Coordinating Committee and the Water Conservation Initiative's Water Resource Work Group detailed 16 strategies for improving Florida's water recycling program, and suggested additional changes to legislation, topics that could be strengthened by rulemaking, as well as future research and technological opportunities worthy of exploration.[210]

While Florida's reuse program is extensive and has been evolving over a number of years, it serves as a useful example of the water savings potential both through aquifer recharge and non-potable water reuse and can be used as a guide in developing a successful water reuse program for Wisconsin and its residents.

Water Reuse and Reclamation

As discussed earlier, water conservation is commonly associated with water demand management strategies, which aim to reduce human consumption and demand for water. Another less common approach to water conservation focuses on the reuse and reclamation of treated wastewater. The utilization of reclaimed water for groundwater recharge occurs through the infiltration and percolation of treated wastewater into the underlying shallow aquifer. Recharge can be accomplished through various methods: surface spreading (which can include the use of infiltration basins), the use of vadose zone injection wells, and direct injection techniques.[193] It has been shown that by returning used water to the same water system, it is possible to reduce groundwater losses to other systems by over 80%.[194]

In addition to its recharge potential, the use of reclaimed water also has tremendous water conservation potential. Reclaimed water can be used for a number of purposes for which potable water is typically used, including urban, industrial, agricultural, environmental and recreational uses, thereby decreasing potable water supply demands. In its *Guidelines for Water Reuse*, published in September 2004, the EPA estimated that 1.7 billion gallons of wastewater was being reused nationally and that this number will continue to grow.[195] California, Florida, Texas and Arizona have large reuse programs in place and many other states have programs that are rapidly expanding. Examples of several of these reuse programs are listed in Appendix B.

It is noteworthy that the largest and most developed water reuse programs have been implemented in arid states or in states which experience seasonal droughts; however, due to the significant water savings attributable to water reuse, its use as a water conservation tool is worth examining in Wisconsin. Converting existing infrastructure to allow for the reuse of reclaimed water for non-potable purposes such as irrigation and commercial use may prove prohibitively expensive to many communities as it requires the creation of a dual distribution system to ensure that potable and reclaimed water are not mixed. However, many of the communities operating with water deficits are doing so due to rapid growth and expansion. In these situations, it may prove financially advantageous for communities to require that any new developments install dual water systems.[196] In contrast, water reuse for purpose of recharging groundwater could be accomplished on-site at wastewater facilities and would likely require less extensive infrastructure modifications than the dual system required for non-potable reuse.

Step Three: Selecting Conservation Measures and Incentives

Based on the above analysis of water use patterns and a review of various conservation programs in effect in other communities, we have assembled a Wisconsin Toolkit, comprised of 12 best management practices for state policy makers to consider when developing comprehensive water conservation programs of their own.

A SAMPLE WISCONSIN CONSERVATION TOOLKIT

1. School and Public Information Programs
2. Residential Low-Flow Toilet and Appliance Replacement and Retrofitting programs and Incentives
3. Landscape Conservation Programs and Incentives for Residential and ICI Customers
4. ICI Customer On-Site Audit Programs and Informational Programs and Incentives
5. Implementation of Conservation Rate Structures
6. Promotion of Efficient Irrigation Practices and Technologies Among Residential, ICI and Agricultural Customers
7. Water Facility Leak Detection and Repair to Achieve Reductions in Unaccounted-for-flows
8. Land Use Planning Protective of Groundwater Resources
9. Developing Groundwater Recharge/ Infiltration Systems
10. Increased Use of Reclaimed Water in Lieu of Other Water Sources – Especially for Irrigation
11. Leading by Example: Water Efficient Technologies and Practices in Public Parks and Buildings
12. Reduction of Thermoelectric Water Use Through the Promotion of Water Efficient Technologies, Renewable Energy Systems and Energy Conservation

Section II Summary

Developing a successful conservation program is a complex task, but a necessary one, as Wisconsin's economy and population continue to grow. Successful conservation programs will vary widely by water system, state, region or even community. As step one indicated, the water use profile of a given water system can affect the types of incentives and measures chosen. Additionally, community norms, values and behavior patterns can also play a role. Likewise, as step two illustrates, a wide variety of incentives and measures exist with varying degrees of effectiveness. Different measures, or different combinations of measures, may produce the same or similar results. As our survey of the implementation of various conservation measures demonstrates, no two communities have identical water conservation plans, as most rely on a comprehensive assortment of tools – behavioral incentives and technical measures – to achieve results.

That said, the preceding analysis of Wisconsin water use patterns and review of best management practices adopted in other areas of the country does suggest that certain conservation practices and incentives lend themselves more readily to local and statewide initiatives in Wisconsin. These measures comprise our Conservation Toolkit, a toolkit we hope will be used by Wisconsin policymakers to develop and implement comprehensive water conservation programs for communities around the state.

SECTION III: A CONSERVATION TOOLKIT CUSTOM FIT FOR THE CITY OF WAUKESHA

This Section refines the Conservation Toolkit developed in the previous section to facilitate a conservation program for the City of Waukesha, Wisconsin.

A Step Forward: Waukesha's Conservation Initiative

On April 25, 2005, the City of Waukesha, together with the Waukesha Water Utility, announced a Conservation Initiative with the stated goal of a 20% reduction in water demand over the next 15 years. In order for Waukesha to actualize its water conservation initiative, the city will need to work together with its utility and populace to undertake the following conservation measures and best management practices, many of which the Waukesha Water Utility is already pursuing:

A Conservation Toolkit For Waukesha

Improvements in Land Use Planning

Waukesha should revise its planning and zoning ordinances to require that new developments have minimal impact on groundwater infiltration through low-impact design, open space goals, and conservation planning. Likewise, it will be important for Waukesha to seek the cooperation of neighboring municipalities and Waukesha County in devising a proactive regional land use plan that both limits future annexations and protects the aquifer recharge areas.

Water Rate Adjustment

Waukesha should charge water rates that encourage conservation. Waukesha and its residents should persuade the Wisconsin Public Service Commission to approve conservation water pricing for the Utility's service area. This would facilitate a change from the existing declining rate structure (where the price of water decreases the more water is used) to an inclining rate structure (where water price increases as use increases) and/or a seasonal rate structure (where water price increases during periods of seasonal demand).

Water Reuse and Recycling

Rather than Waukesha's current practice of using the water drawn from deep sandstone aquifer just once, treating it, and then discharging it into the Fox River where it leaves the watershed and the state, Waukesha should evaluate ways in which its wastewater can be reutilized or recycled, as is currently done by many other municipalities, for numerous industrial, agricultural and irrigational uses. Reclaimed water can also be used to recharge the shallow aquifer reserves of groundwater by surface spreading or infiltration basins.

Seasonal Water Use Restrictions

As people use the most water during the summer, Waukesha should implement seasonal water use restrictions. Waukesha should pass ordinances, including those with enforceable penalties that regulate lawn watering (e.g., time and day restrictions), require sprinkler shut-off devices, prohibit outdoor water waste, and encourage the use of efficient irrigation systems and planting of low water use plants.

Public and Educational Outreach

Waukesha should engage in an extensive and multi-faceted public and educational outreach campaign, including expansion of its current school curriculum beyond fifth grade, the use of utility bill inserts to promote conservation, Public Service Announcements, sponsorship of television and radio ads with information on conservation practices, staffing of informational booths at local fairs, and developing training programs targeting industrial and commercial water users.

Rebate/Retrofit Programs

Waukesha should develop and implement a residential program encouraging replacement and retrofitting of water-inefficient toilets, faucets, showerheads and appliances with low-flow counterparts through financial incentives such as rebates and bill credits.

Industrial/Commercial On-Site Audit Programs

Waukesha should develop and implement an on-site water audit program to assist industrial and commercial water users in developing customized water conservation plans. Costs expended by commercial and industrial water customers to reduce water use are typically recouped by the customers in less than 2 1/2 years through savings in water and energy costs.

Utility Water Leak Detection Program

The Utility should continue to implement and develop its leak detection and repair program to decrease the amount of water lost from broken water mains and from transfer and distribution systems.

POLICY RECOMMENDATIONS

Wisconsin needs to take steps to safeguard its water wealth, prevent future local water conflicts, and address communities already experiencing water supply problems. State officials and policymakers would be wise to rectify the existing gaps in state laws and regulatory systems that effectively forestall the implementation of water conservation measures on a local and statewide basis.

The first half of this Conservation Report identified and evaluated the shortcomings and opportunities present under state law and ultimately supports the following policy recommendations:

- Water conservation programs and planning requirements, including those contemplated under the draft Annex Implementing Agreements, the Conserve Wisconsin Initiative, and the Groundwater Quantity Act, must include implementation and enforcement provisions to be effective.

- Wisconsin Statute § 281.35 should be amended to lower the threshold for triggering conservation requirements from a "water loss" of two million gallons per day to a new or increased water withdrawal in excess of 100,000 gallons per day, irrespective of any calculation of water loss or consumptive water use. A bright line rule like this can be applied simply and uniformly to water users statewide, thereby encouraging local efficiencies while decreasing the likelihood that local water crises will require state expenditures and increased bureaucratic involvement.

- The Wellhead Protection Program should be amended to set water conservation goals, require implementation of water conservation programs, and provide financial incentives comparable to the state's existing lake planning grant program.

- The Groundwater Advisory Committee, created pursuant to the Groundwater Quantity Act of 2004, should draft and recommend the promulgation of regulations requiring conservation for high capacity well permit holders.

- The Groundwater Advisory Committee should recommend conservation as a way to mitigate water problems in the state's Groundwater Management Areas.

- The Annex 2001 Implementing Agreements should require: 1) Conservation by an applicant prior to allowing new withdrawals of water over 100,000 gallons per day; 2) Implementation of state or provincial mandatory conservation programs prior to allowing an application for a diversion of water out of the Great Lakes Basin; and 3) Inclusion of a "stakeholder suit" provision, comparable to the Clean Water Act's citizen suit provision, to encourage implementation of the conservation requirements.

- Wisconsin should commit to the development of an institutional and regulatory framework to facilitate the use of reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.

- Wisconsin land use laws and annexation policies need to be amended and/or enacted to proactively protect water supplies, including groundwater recharge zones, and to facilitate water supply planning at both the local and state level.

- Local communities need to ask regional planning commissions, UW extension representatives, and others involved in assisting local planning efforts to provide the hydrogeologic studies and technical assistance necessary to effectuate groundwater management planning and implementation.

- Local communities should utilize Smart Growth planning efforts and funding to develop comprehensive groundwater management and land use plans.

- The Public Service Commission should produce a uniform rule applying an increasing block rate structure for water utility rates across Wisconsin, enabling water use to be effectively priced to motivate water conservation measures that limit consumption and promote water reuse.

- The Public Service Commission or the Groundwater Advisory Committee should draft legislation and regulations to prohibit large-scale water users from opting out of public water utilities.

- Local governments should follow the City of New Berlin's lead and pass mandatory connection provisions as part of their implementation of water conservation measures.

- Regional cooperation efforts should be supported and pursued at the state and local level to facilitate development, implementation and monitoring of a contractually-binding regional water resource plan, which can provide direction on issues ranging from land use to water rates to groundwater recharge protection.

The second half of this Conservation Report explored additional water conservation opportunities for Wisconsin, including an analysis of Wisconsin water use patterns and a review of best management practices implemented by other states and communities, with the goal of creating a Water Conservation Toolkit for Wisconsin. This Conservation Toolkit was then custom fit to the City of Waukesha, with the hope of providing Waukesha officials, policymakers and citizens with a list of key conservation measures and best management practices to help assist their development of a comprehensive conservation plan for their community.

In summary, Wisconsin communities should apply the lessons learned from other communities and develop and implement comprehensive water management programs. In order to do so, community planners and other stakeholders will need to undergo a realistic assessment of their community's water supply and demand trends and work towards a balanced water budget. They need to identify, evaluate and assess which conservation measures and initiatives make sense for their communities. With the benefit of this knowledge and a vision for the future, planners can think long-term, invest in public education, and take the time necessary to assess the feasibility of water reuse and other conservation alternatives.

Wisconsin communities need not wait for a statewide conservation mandate or for every gap in the law to be addressed before moving forward. Instead, acting proactively will help ensure a clean and abundant water supply to support the well-being and economic health of communities across the state for years to come.

APPENDIX A
EXAMPLES OF WATER CONSERVATION MEASURES AND INCENTIVES[211]

Conservation Measure or Incentive	Examples of Communities Implementing Measure or Incentive
I. SCHOOL & PUBLIC INFORMATIONAL PROGRAMS	
Public Informational Programs (including bill inserts, ads, demonstrations, and publications)	**The Town of Cary, NC** has extensive informational programs in place, including its "Beat the Peak" program which encourages summer water conservation through the use of bill inserts, mailings, newspaper, radio and television advertisements and its "Block Leader" program focusing on indoor and outdoor residential water use. **Phoenix, AZ** in cooperation with Mesa, Scottsdale and the Arizona Department of Water Conservation, launched the "Water Use It Wisely" water conservation campaign in 2000. It has since expanded into a multi-million dollar campaign with over 250 public and private water companies participating nationwide. The city's conservation programs emphasize public education and awareness and include workshops, public events, literature distributions, and information on efficient appliances. **Houston, TX** conducts a number of outreach activities including providing speakers to local businesses and homeowner's associations, attending trade shows, sponsoring an annual water festival, publishing a quarterly newsletter and preparing and distributing water bill inserts. **Tampa, FL** provides a number of downloadable brochures on its website on topics such as "How to Read Your Water Meter," "Conservation Education Program," "Saving Water Indoors," "Save Water; Fix Leaks" and "Saving Water Outdoors."
School Education Programs	**The Town of Cary, NC** has staff members available to teach elementary and middle school lessons on water conservation and related topics and to arrange tours of water and wastewater treatment plants. **Phoenix, AZ** has several school education programs in place, including water conservation education for grades K-12 and Project WET (Water Education for Teachers). **Houston, TX** has initiated several student and teacher education initiatives, including providing speakers for elementary schools, its "WET in the City" water education program for teachers and a "Team WET Schools" program whereby students, educators and administrators make a commitment to increasing environmental education and stewardship in their communities. **Tampa, FL** has several in-school education efforts in place, including an elementary school program (K–5), a middle school program (6–8), a high school program (9–12) and a teacher's program, to teach students, teachers and parents about the importance of water resources and conservation.

II. RESIDENTIAL LOW-FLOW TOILET & APPLIANCE REPLACEMENT & RETROFITTING PROGRAMS AND INCENTIVES	
Water Audits	**The City of Ashland, OR** conducts home or business audits to determine the efficiency of plumbing fixtures, and provides replacement showerheads, faucet aerators and toilet retrofits if needed. Information is also provided on appliance rebates and state tax credits. **The City of Albuquerque, NM** offers free residential indoor/outdoor water audits which include the installation of low-flow showerheads, aerators and shut off hose nozzles. The city also offers ICI Audits for both large and small account holders.
Consumer Rebates and Other Financial Incentives	**The City of Albuquerque, NM** offers a number of water conservation incentive programs, many taking the form of water bill credits. Residential incentives include the following: ▨ Toilet rebates: Residential customers can receive a $125 credit for the first toilet replaced, $75 for the second and $50 for the third. Commercial customers are eligible for credits of $90 per toilet. ▨ Dishwasher rebates: $50 rebates. ▨ Washing machine rebates: $100 water bill credit. **The City of Ashland, OR** offers toilet rebates to customers who replace existing toilets (3.5 gallons or greater) with ultra-low flush toilets; $45 for the first toilet, $35 for the second and $25 for the third. **El Paso, TX** offers a number of water conservation incentive programs to customers of El Paso Water Utilities. Residential incentives include the following: ▨ Ultra low-flow toilet rebates: 75% of purchase price up to $100. ▨ Washing machine rebates: $200 residential / $300 commercial. **The Metropolitan Water District of Southern California**, through its Residential Rebate Program, provides rebates for low-flush and dual-flush toilets and clothes washers.
Use of Low-Flow Plumbing Fixtures	**Houston, TX** distributes more than 20,000 "water saver" kits to citizens each year to help them reduce water consumption. The kits contain a displacement bag for the toilet tank, dye tablets for testing leaks, a tankee clipper, a flow restrictor and an instruction manual. Kits are also provided to apartment complex owners and managers. **Tampa, FL** provides free plumbing retrofit kits which include showerheads, bathroom and kitchen aerators and dye tablets for leak detection.

III. LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES FOR RESIDENTIAL AND ICI CUSTOMERS	
Promotion of the Use of Native and Drought-Tolerant Turf and Plants	**The City of Albuquerque, NM** offers free xeriscape design templates. **The Town of Cary, NC** offers free workshops on landscape planning, drought tolerant plants, and soil improvement and preparation and has a large volume of information on its website. **Tampa, FL** provides free Xeriscape packets.
Consumer Rebates and Other Financial Incentives	**The City of Albuquerque, NM** offers a number of water conservation incentive programs, many taking the form of water bill credits. Landscape incentives include the following: ▨ Landscape rebates: Credits are given for the removal of high water use landscapes if 50% of the project area is covered by low water use plants as they will appear at maturity. Spray irrigation is not permitted in rebate areas. Single family residential and multi-family and non-residential customers can earn a credit of $0.40 for every square foot of qualifying landscape if a minimum of 500 square feet are converted, up to a maximum of $800 residential and $5,000 non-residential. ▨ Multi-setting sprinkler timer rebates - $10 rebates are offered for the purchase of these devices. ▨ Rainwater harvesting barrel rebates: $25 water bill credit. **El Paso, TX** offers a number of water conservation incentive programs to customers of El Paso Water Utilities including landscape rebates of up to $1.00 per square foot of established grass area that is converted into environmental sensitive and water conserving landscapes. **The Metropolitan Water District of Southern California** has established the City Makeover Program — a competitive grant program providing funding for new Southern California Heritage landscape in prominent public locations within the utility's service areas.
Landscape Standards	**The City of Albuquerque, NM** requires that at least 80% of plants on newly developed properties be low or medium water use. All city-owned new developments other than parks, golf courses, and housing (which are subject to other restrictions) must use medium and low water use plants on 100% of landscaped areas. Violators may be found guilty of a misdemeanor and punished by a fine not to exceed $500 and/or imprisonment for a period not to exceed 90 days.

IV. PROMOTION OF EFFICIENT IRRIGATION PRACTICES AND TECHNOLOGIES AMONG RESIDENTIAL, ICI AND AGRICULTURAL CUSTOMERS	
Informational	**Seattle, WA** offers conservation tips for commercial buildings on its website, including information on efficient irrigation practices. **Tampa, FL** provides sensible sprinkling irrigation evaluations, free rain sensors and rain sensor instructions and a free rain barrel kit. **The Metropolitan Water District of Southern California** offers tips on how to use sprinklers more efficiently. Tools include a "Watering Calculator" that creates a customized water schedule and a weekly watering index to help modify watering schedules in response to weather changes.
Irrigation Scheduling/Water Efficiency Ordinances	**The City of Albuquerque, NM** prohibits sprinkler usage from 10 am to 6 pm from April 1 through September 30. A fee of $20 is assessed on the account holder's water bills for first violations and can be as high as $1,000 if previous violations have already occurred. **The City of Cary, NC** has a year round alternate day watering ordinance in place and requires rain sensors set at 1/4" on all automatic irrigation systems to override irrigation controllers during times of adequate rainfall. Oral or written notices are given for first time violations. Repeat offenders are charged $100 for the first day, $200 for the second, $300 for the third and $400 for every day thereafter. **El Paso, TX** – customers using water from El Paso Water Utilities must comply with mandatory restrictions on certain water use activities including landscape watering day and time restrictions. Violations can result in a class C misdemeanor with fines ranging from $50 to $500 per citation. **Tampa, FL** restricts irrigation to a maximum of two times a week with no lawn watering to occur between the hours of 8 am and 6 pm. Other restrictions apply to personal vehicle washing, pressure washing and outdoor aesthetic uses of water. Restrictions apply to all Tampa Water Department customers and to users of all water sources, including well and surface water located inside Tampa city limits. Violations may result in a fine of up to $500 and a mandatory court appearance.
Penalties for Outdoor Water Waste	**The City of Albuquerque, NM** prohibits water waste as a condition of receiving service from the municipal water utility. Enforcement occurs mostly thought complaints which are then observed and documented. Fines are assessed on water bills and increase from $20 for the first offence to $1,000 and the addition of a flow restriction device or $2,000 for the ninth violation. **The City of Cary, NC** prohibits over watering landscapes by (1) directly watering impervious surfaces and (2) over watering beyond the soil's saturation point. Oral or written notices are given for first time violations. Repeat offenders are charged $100 for the first day, $200 for the second, $300 for the third and $400 for every day thereafter.

	El Paso, TX – customers using water from El Paso Water Utilities are prohibited from wasting water which is defined as (1) landscape watering on the wrong day, (2) allowing water to flow into public rights of way or storm drains and (3) failure to repair a leak within five working days of detecting it. Violations can result in a class C misdemeanor with fines ranging from $50 to $500 per citation. **Tampa, FL** prohibits all wasteful and unnecessary water use. Violations may result in a fine of up to $500 and a mandatory court appearance.
V. ICI CUSTOMER ON-SITE AUDIT PROGRAMS, INFORMATIONAL PROGRAMS AND INCENTIVES	
Water Audits	**Houston, TX** conducts water audits for customers with large irrigation landscapes and/or cooling towers. Customers are trained how to use their systems more efficiently in order to decrease water use and reduce their water bills.
Training Programs and Direct Technical Assistance	**Seattle, WA,** as part of its "Water Smart Technical Program," offers its regional and ICI Customers information on end use metering, life-cycle cost analysis, speaking engagements on water conservation, technical information on water efficient technologies, bill analysis, water efficient irrigation information an on-site water audits. **Phoenix, AZ** provides technical assistance to industry, business and government by helping create and monitor water budgets, conducting on site water audits, and assisting in developing water conservation plans. The city also provides technical assistance to city departments.
Consumer Rebates and Other Financial Incentives to Encourage Reduction in Water Use (including surcharges and bill credits)	**Seattle, WA**, as part of its "Water Smart Technology Program," offers financial assistance for qualified water conservation projects completed by large and small businesses. Assistance has included up to 50% of the project cost for commercial and multi-family irrigation systems, water efficient changes relating to process water, commercial laundry, vehicle washing and other unique water use technologies. These incentives often reduce paybacks from over three years or more to one to two years or less. **El Paso, TX** offers a number of water conservation incentive programs to ICI customers of El Paso Water Utilities. These incentives include the following: ▨ Refrigerated Air Conditioning: El Paso Water Utilities and El Paso Electric offer a joint rebate of $300 (plus any additional incentives offered by dealers) to customers or builders who replace existing evaporative water cooling systems with central refrigeration units in their existing home or install a unit in their new home. ▨ Hot Water on Demand (HWD) Pilot Program: $100 rebate for the installation of an approved Hot Water on Demand or Hot Circulation Pump System.

The Metropolitan Water District of Southern California has a number of financial incentives in place targeting ICI Customers:

- The Innovative Conservation Program is designed to provide grants to explore the water savings potential and practicality of new water conserving technologies. Special consideration is given to projects promoting water-landscape saving products or technologies.
- Save A Buck is an aggressive rebate program tailored for the commercial sector. It includes rebates for the installation of ultra-low flush toilets and urinals ($60), clothes washers ($100+), pressurized waterbrooms ($100+), pre-rinse kitchen sprayers ($50+), cooling tower conductivity controllers ($500+), and X-Ray Film Processor Recirculation Systems ($2,000+).
- The Industrial Process Improvement Program offers financial assistance to local industries to encourage investment in water-saving process improvements. Incentives include: the lesser of (1) $2.26 per 1,000 gallons of actual water saved for a one-year monitoring period, (2) 50% of the project's water-related process improvements, and (3) a buy down of project costs to reduce the simple pay back period to two years.

VI. IMPLEMENTATION OF CONSERVATION RATE STRUCTURES

The City of Cary, NC has implemented multi-tiered increasing block water rates. Residential and single family rates range from $3.28 k/gals to $10.83 k/gals. Non-residential and multi-family residential users are given a water budget based on historical water use and are charged $3.75 k/gals for water used up to the budgeted amount and are charged $11.88 k/gals for water use in excess of this amount. Reduced water rates are available for reclaimed water use.

Seattle, WA has implemented a three-tier seasonal residential rate structure. During off-peak seasons, residents inside the city limits pay $2.35 per 100 cubic feet of water (748 gallons). Rates rise to $2.88 per 100 cubic feet for the first 1,000 cubic feet used in 60 days from May 16 through September 15, $3.35 per 100 cubic feet for the next 2,600 cubic feet and $8.55 per 100 cubic feet for over 3,600 cubic feet used in 60 days. Commercial users pay $2.00 per 100 cubic feet used off peak and $3.35 per 100 cubic feet from May 16 through September 15 in addition to a set per-month base service charge that can range from $6.90 to $1,668 depending on meter size.

Houston, TX revised its model contract for industrial and municipal users in 1994. Customers whose consumption exceeds their normal average 30-day billing period by more than 10% are charged a 5% penalty. Contract customers are required to prepare conservation plans.

Tampa, FL has implemented an increasing block rate structure. Residential rates are based on a five-tier system with prices per 100 cubic feet ranging from $1.04 to $3.12 inside the city limits. Commercial rates are based on a four-tier system with prices per 100 cubic feet ranging from $1.20 to $3.12 inside the city limits.

VII. WATER FACILITY LEAK DETECTION AND REPAIR	
	Illinois – all Lake Michigan water users, as a condition to receiving an allocation permit from the Illinois DNR, must reduce unaccounted-for flows to 8% or less based on annual pumpage and implement leak monitoring programs To comply with the Illinois requirement, Chicago has implemented a five-year, $620 million capital improvement program to reduce unaccounted-for flow and water pumpage by replacing 50 miles of leaking water mains each year.
VIII. LEAD BY EXAMPLE – WATER EFFICIENT PRACTICES IN PUBLIC PARKS AND BUILDINGS	
	Seattle, WA has been actively pursuing water conservation measures internally. Seattle currently has 16 city-owned projects participating in the LEED Program (Leadership in Energy & Environmental Design), including the Carkeek Park Environmental Learning Center. Biofiltration swales and infiltration trenches at the center will reduce impact on city water supplies and recharge the aquifer. No storm water will drain off site. Rainwater captured from the roof and stored in a cistern and rain barrels will help water plants and flush toilets. These features, along with faucet aerators, low volume and pressure assist toilets will reduce net water use at the center by more than 30%.[212]
IX. REDUCTION OF THERMOELECTRIC WATER USE	
	U.S. Department of Energy – in order to reduce the amount of freshwater used by power plants and to minimize impacts on water quality, the U.S. Department of Energy's National Energy Technology Laboratory has initiated a power plant water research and development program through its Innovations for Existing Plants (IEP) program. The program aims to develop technologies to better manage how power plants use and impact fresh water sources. The project is built around partnerships with industry, academia and other government and non-government organizations. Five research projects are currently being conducted including, "Use of Produced Water in Recirculated Cooling Systems at Power Generation Facilities," "Water Extraction from Coal-Fired Power Plant Flue Gas," and "Environmentally Safe Control of Zebra Mussel Fouling."

APPENDIX B
EXAMPLES OF WATER RECYCLING PROGRAMS[213]

Location of Program	Description
Orange County, CA Orange County Water District (OCWD)	Orange County's Groundwater Replenishment System (GWR), scheduled for completion in 2007, will take waste water and purify it to levels similar or better than bottled water. This purified water will be used to replenish the groundwater basin underlying north and central Orange County. Purified water will be pumped to spreading basins and will follow the same natural filtering path as rainwater and will also be used to expand the seawater intrusion barrier that currently keeps the Pacific Ocean out of the groundwater basin. Once in the groundwater basin, the purified water will blend with groundwater from the Santa Ana River and imported sources. Upon completion, the GWR will generate enough pure drinking water to meet the needs of 114,000 families, exceed all state and federal drinking water standards and be the largest water purification project of its kind in the world. OCWD currently operates Water Factory 21 which treats reclaimed water. This water is then blended with deep well water and pumped into the groundwater basin via a series of 23 multi-point injection wells. The injected water forms a water-mound between the ocean and groundwater basin preventing seawater intrusion. The majority of water injected ultimately augments Orange County's domestic groundwater supply. OCWD also currently owns and operates 1,000 acres of recharge spreading facilities including 17 major facilities.
El Paso, TX El Paso Water Utilities (EPWU)	The Fred Hervey Water Reclamation Plant, located in Northeast El Paso, Texas, purifies reclaimed water to drinking water quality levels for reinjection into the Hueco Bolson through a series of injection wells. In 2004, a total of 577 million gallons of reclaimed water was returned to the Hueco Bolson. The plant also supplies approximately 889 million gallons of water to the El Paso Electric Company each year for use in their cooling towers and approximately 187 million gallons of water to a local golf course for irrigation purposes. Beginning in 2005, the plant will supply 20 million gallons of water annually to the City of El Paso Regional Park with this number expected to increase to 72 million gallons annually after full implementation of the program. In addition to the Fred Hervey Plant, El Paso Water Utilities has several other water reclamation facilities.
Denver, CO Denver Water	Denver's new recycling plant on the South Platte River in Commerce City came on line April 1, 2004, and is the largest in the state. From start up through the end of the irrigation season in the fall of 2004, approximately 1,344 million gallons of recycled water were delivered to customers via twelve miles of pipeline. Customers included schools, parks and golf courses. Phase two of the distribution system, which will add a storage reservoir, pump station and six additional miles of pipe is scheduled to be completed by 2007. Future phases will provide recycled water to additional parks and schools, as well as the Denver Zoo, Airport and University. At full capacity, the recycling plant will receive 45 million gallons of water a day from Metro Wastewater's treatment plant.
Gilbert, AZ	Since 1986, the town of Gilbert, Arizona has been using 100% of its reclaimed water. A portion of the reclaimed water is being used to charge the shallow water table through 18 recharge ponds located on over 175 acres at two urban locations and a third site measuring 70 acres. An added benefit of these recharge areas is the creation of a desert riparian habitat that attracts a variety of wildlife – these riparian areas occur naturally on less than 1% of the land in Arizona but support 60% of the state's wildlife. Reclaimed water is also used by a wide variety of customers for irrigation, aesthetic purposes (such as fountains and decorative ponds), and various industrial uses. While there are no current plans to serve individual homeowners, developers of new communities and businesses are responsible for building the infrastructure needed to connect to the town's reclaimed water system.

APPENDIX C
Examples of Indoor Residential and Domestic Water Efficiency Hardware Measures and Potential Water Savings[214]

Low-volume toilets and urinals	▨ Replacing a 4.5 gallon per flush (gpf) toilet with a 1.6 gpf toilet saves 14,252 gallon per household per year. ▨ Replacing the same toilet in an office building saves 2,262 gallons per female and 754 gallons per male per work-year (260 days). ▨ Some toilets use as much as 7.0 gpf. ▨ Replacing a 4.5 gpf urinal with a 1.0 gpf urinal saves an estimated 1,820 gallons of water per male per work-year.
Low-volume showerheads and showerhead retrofit devices	▨ Replacing a showerhead with a rated flow of 3.0 gallons per minute (gpm) with a showerhead with a rated flow of 2.5 gpm saves an estimated 1,702 gallons of water per household per year.
Low-volume faucets and faucet retrofit devices	▨ Replacing a faucet with a rated flow of 3.0 gpm with a faucet or aerator with a rated flow of 1.5 gpm saves an estimated 7,850 gallons per household and an estimated 445 kilowatt-hours of energy per year. ▨ Retrofitting a high-volume faucet is often much less expensive than replacing it and usually leads to comparable water savings.
Toilet and urinal retrofit devices	▨ Water savings from toilet retrofit devices vary depending on device installed and range from 0.5 to 1.5 gpf with average household savings of 2 to 4 gallons per capita per day (gpcd). ▨ Adjustments to urinal flush valves save an estimated 0.5 gpf to 2.0 gpf.
Toilet and urinal leak repair	▨ The average amount of water lost through leakage (mostly from toilets) is 9.5 gpcd. ▨ A toilet that leaks 5 gpd wastes 1,825 gallons of water a year. ▨ It is estimated that 5.5% of homes have leaks averaging more than 100 gpd. ▨ Jammed or malfunctioning flush-valve toilets in non-residential facilities can lose 2,100 gallons of water per hour.
Faucet leak repair	▨ Water loss from a leaky faucet can range from several gallons to several hundred gallons a day.
Water-efficient dishwashers	▨ Replacing a dishwasher that uses 9.5 to 12.0 gallons a load with one that uses 7.0 gpl can save an estimated 361 gallons of water per household per year and save 940 kilowatt hours of energy.
High-efficiency clothes washers	▨ Replacing a clothes washer that uses 43 gallons per load with a 27 gpl washer saves an estimated 5,705 gallons per household per year and 615 kilowatts of energy. ▨ Some clothes washers use as much as 56 gallons per load.

APPENDIX D
CONTACT INFORMATION FOR CONSERVATION AND WATER REUSE AND RECYCLING PROGRAMS

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Robbin Pearce
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City of Ashland
Conservation Division
Phone: 541-552-2062
Fax: 541-552-2050
Email: pearcer@ashland.or.us
http://www.ashland.or.us/sectionindex.asp?sectionid=432

TOWN OF CARY, NC
http://www.townofcary.org/depts/pwdept/water/waterconservation/overview.htm

For more information on the Town's water conservation program:
Jennifer Platt, Water Conservation Manager
Department of Public Works and Utilities
919-462-3872 (phone)
919-388-1131 (fax)
jennifer.platt@townofcary.org

For irrigation and outdoor water use questions:
Rick Jordan, Water Conservation Technician
Department of Public Works and Utilities
919-462-3879 (phone)
919-469-4304 (fax)
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For Block Leader and other education programs:
Marie DelForge, Water Conservation Education Specialist
Department of Public Works and Utilities
919-469-4387 (phone)
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For landscape budgets:
Scot Berry, Water Conservation Analyst
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http://www.ci.gilbert.az.us/water/popups/reclaimedwater.cfm

HOUSTON, TX
City of Houston
Public Utilities Division
Water Conservation Section
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Illinois Department of Natural Resources
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http://dnr.state.il.us/

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
For policy and legislative information relating to water recycling, ground water recovery, sea water desalinization and conservation:
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For information relating to the operation and implementation of the above-mentioned programs:
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SEATTLE, WA
http://www.seattle.gov/util/Services/Water/index.asp
http://www.savingwater.org

For more information on educational programs:
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For more information on program support:
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http://region.waterloo.on.ca

ENDNOTES

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[5]http://www.aqua.wisc.edu/waterlibrary/facs.asp.

[6]REBECCA LAMEKA, GREAT LAKES COMMISSION, SUMMARY OF CURRENT WATER CONSERVATION PRACTICES IN THE PUBLIC WATER SUPPLY SECTOR OF THE GREAT LAKES-ST. LAWRENCE REGION 2 (2004).

[7]Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776, 102d Congress, (1992).

[8]AMY VICKERS, HANDBOOK OF WATER USE AND CONSERVATION 20 (Water Plow Press 2001).

[9]Safe Drinking Water Act, 42 U.S.C., Chapter 6A, s/s 300f et. Seq. (1974); Safe Drinking Water Act Amendments of 1996, Pub. L. No. 104-182, 104th Congress (1996); VICKERS, *supra* note 8, at 17, 20; REBECCA LAMEKA, *supra* note 6, at 16.

[10]According to the DNR, while the costs associated with a local governmental unit's voluntary development of a conservation plan may be loan eligible, the amount of money available in the State Revolving Fund for Wisconsin drinking water systems does not approach identified needs. Email from Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. Dep't Nat. Res., to Jodi Habush Sinykin (Oct. 26, 2005) (on file with Midwest Environmental Advocates); Telephone interview by Jodi Habush Sinykin with Dan Duchniak, Waukesha Water Utility Manager (Oct. 18, 2005).

[11]Under Wis. Stat. § 281.35(8) (2004):

> The natural resources board, shall, before August 1, 1988, adopt and submit to the chief clerk of each house of the legislature, for distribution to the members under § 12.172(2), a long term state water quantity resources plan for the protection, conservation and management of the waters of the state. The plan shall include, but need not be limited to, the following:
> (a) The description of a system for allocating this state's water resources during a water shortage or other emergency.
> (b) Identification of the existing uses of the waters of the state.
> (c) An estimate of future trends in water use.
> (d) Recommendations for the use, management and protection of the waters of the state and related land resources that will affect persons subject to (4).

[12]Lynn McIntosh & Allen Shea, Wisconsin Water Quantity Resources Management Plan, Wis. Dep't of Nat. Res., Vol. 1–9 (Aug. 1987).

[13]Wis. Stat. § 281.35(4)(b)(1) & (2) (2004), http://www.legis.state.wi.us/rsb/stats.html. In the case of increased withdrawals, a person must obtain a water loss permit if such person proposes to increase an existing withdrawal that will result in a water loss averaging more than 2 mgd in any 30-day period above the person's authorized base level of water loss. "Authorized base level of water loss" is defined in Wis. Stat. § 281.35(1)(b) (2004).

[14]Wis. Stat. § 281.35(5)(a)(15) (2004), http://www.legis.state.wi.us/rsb/stats.html.

[15]Wis. Stat. § 281.35(5)(d)(3) (2004), http://www.legis.state.wi.us/rsb/stats.html.

[16]Wis. Stat. § 281.35(5)(d)(7)(a) (2004), http://www.legis.state.wi.us/rsb/stats.html. For purposes of this section, "inter-basin diversion" means "a transfer of the waters of the state from either the Great Lakes basin or the Mississippi River basin to any other basin." Wis. Stat. § 281.35(1)(g) (2004), http://www.legis.state.wi.us/rsb/stats.html. Note that this is much broader than the definition of inter-basin diversion in the draft Charter Annex Implementing Agreements.

[17]In the last two years, a number of power plants that use cooling towers, rather than once-through cooling systems, have exceeded the threshold and thereby required water loss permits. The DNR did not require conservation measures as part of their approval, explaining that such measures do not readily lend themselves to water use for power production as the primary use of the water is for cooling purposes. Telephone interview by Donna McGee with Duane Schuettpelz, Section Chief Wastewater Permits and Pretreatment, Wis. Dep't of Nat. Res. (Oct. 31, 2005).

[18]Memorandum from C.D. Besadny, Secretary, Wis. Dep't of Nat. Res., to the Hon. Tommy G. Thompson, Governor of Wis. *Briefing on Proposed Town of Pleasant Prairie Interbasin Diversion* (Aug. 13, 1987) (on file with Midwest Environmental Advocates); Wis. Dep't of Nat. Res., Manitowoc Water Withdrawal Evaluation (Nov. 3, 2004) (on file with Midwest Environmental Advocates); Telephone interview with Duane Schuettpelz, *supra* note 17.

[19]With respect to the Manitowoc Request, see footnotes 24–26 for an explanation as to why the DNR did not require a water loss permit. With respect to Pleasant Prairie, it is unclear how the DNR reached its decision that no water loss permit was required as no water loss calculations were contained in the DNR's correspondence files reviewed at the DNR by Donna McGee on August 2, 2005, (excerpts of DNR correspondence file on file with Midwest Environmental Advocates. The Oak Creek plants were designed to use once-through cooling systems. As explained in greater detail in section II of this report, in once-through cooling systems, only a small percentage of total water used for cooling is actually consumed within the plant as the water does not come into contact with air. It is important to note, however, that the cooling water is returned to the original water source at higher temperatures then which it was removed thereby increasing evaporation. When dealing with once-through cooling systems, the DNR does not take water loss due to evaporation post discharge into account when making water loss calculations. Telephone interview with Duane Schuettpelz, *supra* note 17.

[20]Wis. Stat. § 281.35(1)(L) (2004) and Wis. Admin. Code NR § 142.02(16) (2004) define "water loss" as "a loss of water from the basin from which it is withdrawn as a result of interbasin diversion or consumptive use or both. An "interbasin diversion" is defined under Wis. Admin. Code NR § 142.02(10) (2004) as "a transfer of waters of the state from either the Great Lakes basin or the upper Mississippi River basin to any other basin." The definition of "consumptive use" is found above.

[21a]According to NR 142.02(3) (2004), "consumptive use" has the meaning designated in Wis. Stat. § 281.35(1)(c) (2004).

[21b]For example, NR 142.04(1)(g) provides as follows:

If a person is making a withdrawal for the purpose of operating a public water system, a coefficient to be determined by each person operating such a facility shall be used to determine consumptive use. By March 1, 1989, each person to which this paragraph applies shall provide the department written documentation specifically identifying the consumptive use coefficient, and the method, calculation, formula or device used in determining the coefficient.

No further guidance is provided in the relevant rules and regulations as to how to calculate this coefficient, and it does not appear that the DNR has required persons making withdrawals to provide the agency with these prescribed coefficients.

[22]Interview by Donna McGee with Lee Boushon, Chief, Drinking Water Systems Section, Wis. Dep't Nat. Res. (Sept. 8, 2005).

[23]This 100,000 gallons per day threshold is consistent with the high capacity well permitting requirements set forth under the recently enacted Groundwater Quantity Legislation, 2003 Wisconsin Act 310, which requires well owners to obtain approval of all wells pumping more than 100,000 gallons per day. It is also consistent with the 2005 draft Annex Implementing Agreements.

[24]As set forth within the Manitowoc Water Withdrawal Evaluation, "Therefore, the proposed withdrawal will be evaluated as an increase above base level of water loss. The withdrawal increase does not include an interbasin transfer of water resulting in an evaluation of consumptive use. The base level of water loss is established as the estimated 2006 level of water loss. Water loss for water utilities in Wisconsin has been assigned a factor of 10%. Data from water utilities is reported on a monthly basis. The daily average from the maximum month will be used to determine the daily average maximum water loss during any 30-day period. A 2006 maximum month average of 9.17 MGD results in a base water loss of 0.917 MGD. The maximum month average of 13.69 MGD results in a water loss of 1.369 MGD. The difference is an increase of 0.452 MGD. This is less than the water loss approval threshold of 2 MGD. No water loss approval is required." *See* Wis. Dep't Nat. Res., *supra*, note 18, at 1-3.

[25]Based on the DNR's Water Withdrawal Analysis, it appears as if the withdrawal failed to trigger the water loss permit requirement for two reasons. First, the withdrawal was viewed as an "increased" as opposed to a "new" withdrawal. Pursuant to the statute, when dealing with increased withdrawals, base water loss is to be taken into account – essentially grandfathering in existing water loss. Second, the DNR did not look at total plant capacity for the new facility servicing the Water Authority (in this case 30 mgd) when calculating water loss. Rather, the DNR looked at the highest day of pumping over the design life of the facility. An argument can be made that since the Water Authority is changing its source of water – from groundwater to surface water – that it is a "new" withdrawal. One can also argue that the DNR should have used total plant capacity, instead of highest anticipated pumpage in making its calculations. *See* footnote 24 for the DNR calculations., Wis. Dep't Nat. Res. *supra* note 18, at 1-3.

[26]In addition to the issues raised in the previous footnote, an argument can be made that the DNR incorrectly applied a 10% water loss coefficient. The DNR applied a 10% consumptive use coefficient based upon unaccounted for water loss rather than a specific consumptive use coefficient as required under NR § 142.04. However, the DNR also attempted to calculate actual consumptive use using what they called an "enhanced analysis." This enhanced analysis involved calculating industrial/commercial (IC) use, based on utility records, and outdoor (OD) use, based on water use estimates. Nonetheless, even under the enhanced analysis, the 2 mgd threshold was not triggered, leading to the DNR's conclusion, "As evidenced by the more rigorous evaluation, the consumptive use would not exceed 5 MGD therefore the decision would reside with the state regardless of the evaluation protocol. Using current NR § 142 state review threshold of 2 MGD a water loss approval is not required. The withdrawal may proceed without further water loss evaluation." *Id.*

[27]Wis. Dep't of Nat. Res., Wellhead Protection Program, http://www.dnr.state.wi.us/org/water/dwg/gw/wellhead.htm.

[28]Wis. Adm. Code, NR§ 811(16)(5)(g) (2004). The DNR maintains a list of communities that have a wellhead protection plan for at least one well. That list identifies 265 communities out of a total of 564 potential municipal water supply systems that use groundwater that actually have a plan. *See* http://www.dnr.wi.gov/org/water/dwg/gw/whp/communities.pdf. To assist communities in designing Wellhead Protection Plans (WHPs), the DNR provides conservation information on its website; *see* i.gov/org/water/dwg/gw/whp/whptplat.pdf.

[29]Email from, Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. Dep't Nat. Res., to Jodi Habush Sinykin (May 3, 2005). The DNR does provide materials on its Wellhead Protection website to offer assistance to communities in designing a water conservation program, including those found at http://dnr.wi.gov/org/water/dwg/gw/whp/whptplat.pdf and http://dnr.wi.gov/org/water/dwg/gw/whp/whp-ss.htm.

[30]Email from Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. Dep't Nat. Res., to Jodi Habush Sinykin (April 20, 2005) (on file with Midwest Environmental Advocates).

[31]As stated under Wis. Admin. Code NR § 190 (2004), "Grants made under this program will assist lake planning projects. They will assist local organizations by helping to provide information and education on the uses of lakes, the quality of water in lakes and . . . will be used to improve lake management assessment and planning…"; *see also* Wis. Stat. § 281.68 and 281.69 (2004).

[32]Email from Ezra Meyer, Wisconsin Association of Lakes, to Jodi Habush Sinykin, (Oct. 31, 2005); *see also* http://www.dnr.state.wi.us/org/water/fhp/lakes/lakeplan.htm; http://www.dnr.state.wi.us/org/water/fhp/lakesprot.htm.

[33]Id.

[34]2003 Wisconsin Act 310 (2004).

[35]2003 Wisconsin Act 310 (2004); *see also* Scott Hassett, Secretary, Wis. Dep't Nat. Res., Scoping Statement (March 11, 2005), setting forth the charges of Groundwater Advisory Committee.

[36]Draft Great Lakes Compact, Section 4.9(1) (2005).

[37]Draft Great Lakes Agreement, Appendix 1, Procedures Manual, Part 1 (1)(A) (2005) (emphasis added), Part 1(1)(G)(applying same standard to exceptions to the diversion prohibition).

[38]Draft Great Lakes Agreement, Appendix 1, Procedures Manual, Part 1 (1)(A) (2005).

[39]Draft Great Lakes Agreement, Article 303 (2005).

[40]Draft Great Lakes Agreement, Article 303(1) (2005).

[41]Draft Great Lakes Agreement, Article 303(4)(d) (2005).

[42]Draft Great Lakes Agreement, Article 303(5) (2005).

[43]It further appears that the latest draft of the Implementing Agreements now may have a provision that requires retroactive conservation.

[44]Draft Great Lakes Agreement, Article 103 (2005).

[45]http://www.wispolitics.com/1006/Conservation_Initiative_8.18.pdf.

[46]Statement by Todd Ambs, Water Division Administrator, Wis. Dep't of Nat. Res., to Jodi Habush Sinykin (Oct. 19, 2005); *see also* Midwest Environmental Advocates, Great Lakes Policy Report (forthcoming 2006), for discussion of Annex 2001 Implementing Agreements.

[47]It has been estimated that "recycling" or "recharge" water systems can support eight to 20 people per acre in contrast to the two to five people supported by wasting systems. D.S. Cherkauer & S.A. Ansari, *Estimating ground water recharge from topography, hydrogeology and land cover*, 43, 1 Ground Water 102-112 (2005).

[48]U.S. ENVTL. PROT. AGENCY, PUB. NO. EPA/625/R-04/108, GUIDELINES FOR WATER REUSE (2004).

[49]"This document is intended to be solely informational and does not impose legally binding requirements on EPA, states, local or tribal governments, or members of the public." *Id.* at 1.

[50]*Id.* at 149; *see also* Email from Robert Bastion, Senior Environmental Scientist, U.S. Environmental Protection Agency Office of Wastewater Management to Donna McGee, Midwest Environmental Advocates (July 27, 2005): "Individual states under state authority, rather than EPA, directly regulate water reuse…While EPA certainly could develop water reuse/recycling criteria or regulations under the Clean Water Act, I know of no ongoing effort in this area or plans to do so in the near future."

[51]U.S. ENVTL. PROT. AGENCY, *supra* note 48 at 149.

[52]The EPA's federal guidelines include a summary of state reuse regulations and guidelines; Wisconsin's sole entry regards regulations addressing "Agricultural Reuse Non-Food Crops." *Id.* at 152; *see also* Table A-4, 388.

[53]Telephone interview by Jodi Habush Sinykin, with Attorney Chuck Hammer, Bureau of Legal Services, Wis. Dep't of Nat. Res. (May 9, 2005); *see also* Wisconsin's Groundwater Standards Law, Chapter 160, Wis. Stats, and Chapters NR 140, NR 140, NR 206 and NR 214, Wis. Admin. Code; *see also* Email from Tom Gilbert, Wastewater Facility Planning Coordinator, Bureau of Watershed Management, Wis. Dep't of Nat. Res., to Jodi Habush Sinykin (May 18, 2005).

[54]Telephone interview by Jodi Habush Sinykin with Tom Gilbert, Engineer, Wastewater Facility Planning Coordinator, WDNR Bureau of Watershed Management (May 18, 2005); *see also* Telephone interview by Donna McGee with Scott Tesmer, Plant Supervisor, Lake Geneva Wastewater Treatment Facility (May 20, 2005).

[55]*Id.*

[56]Telephone interview with Tom Gilbert, *supra* note 54.

[57]*Id.; see also* Wis. Admin. Code, NR § 110 (2004).

[58]Corissa Jansen, Waukesha County Population Booms, MILWAUKEE J. SENTINEL, Mar. 8, 2001.

[59]*Id.*

[60]Waukesha, Wisconsin Water System Master Plan, 2.3 (June 2005).

[61]These homes are expected to range in costs between $400,000 and $700,000. Interview by Jodi Habush Sinykin with Steven Crandell, City of Waukesha Community Development Director and Doug Koehler, City of Waukesha Department of Community Development Planner, Waukesha, Wisconsin (July 20, 2005).

[62]Waukesha, Wisconsin Water System Master Plan, *supra* note 60.

[63]The service area is defined as the area that is expected to require Waukesha Water Utility water services over the planning period. Waukesha, Wisconsin Water System Master Plan, *supra* note 60, at 2.4.

[64]CH2M HILL, Report on Future Water Supply Prepared for Waukesha Water Utility, March 2002, at 1-6.

[65]Interview with Steven Crandell & Doug Koehler, supra note 61.

[66]Email from Doug Koehler, City of Waukesha Planner, to Jodi Habush Sinykin, Midwest Environmental Advocates, with chart attachment "City of Waukesha-Area: Year End totals From Annexations." (Jul. 26, 2005); *see also* Telephone interview by Jodi Habush Sinykin, with Doug Koehler, City of Waukesha Department of Community Development Planner (Jul. 27, 2005).

[67]Indeed, other than a DNR sewer service allocation, which can be modified and expanded upon request, no barriers exist to Waukesha's expansion until such time as its growth brings it into proximity to other growing municipalities like the Town of Genesee and Delafield. Telephone interview by Jodi Habush Sinykin with Doug Koehler, City of Waukesha Department of Community Development Planner (Jul. 25, 2005).

[68]This is consistent with the observation of Rod Nilsestuen, Secretary of the Wisconsin Department of Agriculture, Trade and Consumer Protection, that the triangle between Madison, Milwaukee and Chicago is losing prime farmland, some of the nation's best, at the third fastest rate in the country. According to the US Dep't of Agric., the amount of farmland in the state has dropped 14% over the last 20 years. Jason Stein, *Keeping Farms from Vanishing*, WIS. ST. J., June 4, 2005, at AI. http://www.madison.com/archives/read.

[69]To the best of their recollection, neither City planner could recall an instance when a petition for annexation was refused either by the City Common Council or the Department of Administration, Interview with Steve Crandel & Doug Koehler, City of Waukesha Department of Community Development, *supra* note 61.

[70]Wis. Stat. § 66.1001 (2004).

[71]Under Wis. Stat. § 66.1001, communities in Wisconsin are eligible to receive state planning grants provided by the Wisconsin Department of Administration to pay approximately half of the costs associated with the preparation of a comprehensive plan required under the law. As of March 2004, over 600 governmental bodies have received over $11.3 million in funding from the Comprehensive Planning Grant Program. See 1000 Friends of Wisconsin, Smart Growth Funding, http://www.1kfriends.org/smartgrowth/sg_law.shtml.

[72]Wis. Dep't Nat. Res., Smart Growth Publication, http://www.dnr.state.wi.us/org/water/dwg/gw/pubs/smartgrowth.

[73]The nine Smart Growth Local Plan Elements include: Issues and opportunities; Housing; Transportation; Utilities and community facilities; Agricultural, natural and cultural resources; Economic development; Intergovernmental cooperation; Land-use; and Implementation.

[74]Nonetheless, communities interested in protecting their community groundwater supplies must be sure to prioritize groundwater issues within this process, as Smart Growth's sole reference to groundwater appears in its fifth element entitled "Agricultural, natural and cultural resources element," where it is lumped together for consideration with sixteen other natural, historical and cultural resources.

[75]Wis. Stat. § 66.1001 (2)(e) (2004).

[76]Email from Greg Kessler, Director of Department of Community Development, City of New Berlin, to Jodi Habush Sinykin (May 4, 2005), identifying the $235,000 in costs associated with Groundwater studies conducted in New Berlin over the past 17 years, which ultimately led to the identification of New Berlin's groundwater recharge zone and the subsequent enactment of a model land-use ordinance to protect this area. This zoning ordinance, based upon the principles of noted conservation planner, Randall Arendt, and recently approved by New Berlin's Common Council, establishes a 75% Open Space requirement for new subdivision developments. *See* New Berlin's General Code Publishers - Zoning Ordinance (Chapter 275), http://www.newberlin.org/display/router; *see also* Reid J. Epstein, *New Berlin OKs Conservation Rule*, MILWAUKEE J. SENTINEL, April 12, 2005, http://www.jsonline.com/news/wauk/apr05/317956.asp.

[77]State of Wisconsin, Department of Administration, Comprehensive Planning Grant Program, http://www.doa.state.wi.us/dir/documents/multijresolution_Sample.pdf.

[78]*See* Table 2: "The relationship of groundwater to other elements of comprehensive planning," Comprehensive Planning and Groundwater Fact Sheet 1, Wisconsin Groundwater Coordinating Council, July 2002, at http://dnr.wi.gov/org/water/dwg/gcc. Yet another opportunity for the state's progress in this area regards the infiltration requirements provided under Wis. Admin. Code NR § 151, Subchapter III, which requires to the maximum extent possible, the infiltration of stormwater or "run-off volume."

[79]Behm, Don, *Study to test waters in Richfield*, MILWAUKEE J. SENTINEL, Sept. 15, 2003.

[80]*Id.*

[81]Telephone interview by Jodi Habush Sinykin with Douglas S. Cherkauer, Ph.D., Professor of Hydrogeology, University of Wisconsin-Milwaukee (Apr. 20, 2005); see also Daniel S. Alessi & Douglas S. Cherkauer, University of Wisconsin-Milwaukee, *Insights from a Ground Water Model of a Rural Township: Richfield, Washington County, Wisconsin,* Mar. 3, 2005.

[82]Telephone interview with Douglas S. Cherkauer, *supra* note 81; *see* also Alessi and Cherkauer, *supra* note 81 and Behm, Don, *supra* note 79.

[83]Wis. Stat. Ann. § 66.0815 (2)(a) (2003).

[84]In a 1996 survey conducted by the American Water Works Association (AWWA), 827 water facilities throughout the U.S. were asked to identify their rate structures and distilled five different rate structures. *See* LAMEKA, *supra* note 6, at 30.

[85]*See* Public Service Commission of Wisconsin, *Questions Related to the Conventional and Simplified Rate Case Process* (2005), http://psc.wi.gov/consumer/faq/water/rateQuestions.htm.

[86]LAMEKA, *supra* note 6, at 30.

[87]*Id.* at 31.

[88]Patrick Mann, *Water-Utility Regulations: Rates and Cost Recovery*, 13 (1993), http://www.rppi.org/ps155.html.

[89]*Id.*

[90]LAMEKA, *supra* note 6, at 31, Table 17; *see* also VICKERS, *supra* note 8.

[91]*See* Wis. Stat. Ann. § 66.0803(1)(a)(2003).

[92]Wis. Stat. Ann. § 66.0801(1)(a)(2003); Public Service Commission of Wisconsin, *supra* note 85.

[93]Public Service Commission of Wisconsin, *supra* note 85.

[94]Wis. Admin. Code. Public Service Commission § 185.21 (1997).

[95]AMERICAN WATER WORKS ASSOCIATION AND RAFTELIS FINANCIAL CONSULTANTS, INC., WATER AND WASTEWATER RATE SURVEY 2004, 94 (2004). Note that median calculations were based upon rate surveys of 266 facilities, 41 in the Northeast, 51 in the Midwest, 101 in the South and 73 in the West. Rate data is current as of the later part of 2003.

[96]*Id.* at 24-33. The survey bases average water use on responses received from 263 US water systems. We calculated the Wisconsin average based upon water charges (7,480 gallons of use) provided for the six Wisconsin utilities (7,480 gallons) as found in Exhibit 2 of the AWWA Water and Wastewater Rate Survey. Note that the study does not prove a breakdown of regional averages, only medians as per the previous footnote.

[97]The chart below provides a comparison of several selected net quarterly bills of Wisconsin Water Utilities using rates in effect as of January 25, 2005, for 5/8 inch meter connection, residential and small commercial services Class AB Utilities assuming quarterly usage of 18,750 gallons per connection. Public Service Commission of Wisconsin, Comparison of Net Quarterly Bills of Wisconsin Water Utilities Using Rates in Effect as of January 25, 2005 (Division of Water, Compliance and Consumer Affairs Bulletin 25, 2005).

[98]Rate schedule varies based on location being served.

[99]Wisconsin Gas' comparatively high rates appear to be the result of high capital costs relating to its acquisition of a number of communities with outdated infrastructure, as well as excess capacity. Telephone interview by Donna McGee with Bruce Schmidt, Cost Engineer, Wisconsin Public Service Commission (July 28, 2005).

[100]This figure represents the average quarterly water bill of all residential and small commercial service class AB utilities per 18,750 as reported in the Comparison of Net Quarterly Bills of Wisconsin Water Utilities, *supra* note 97. It does not represent the average of the several water utilities highlighted in this chart.

[101]Yet another impediment to conservation arises in the context of municipal finance systems. Over past years, the trend has been for municipal utilities across the state to shift from property taxes to user charges to finance the utilities' capital improvement costs. The impact of this from a conservation perspective is that if a utility's customers start conserving water, the utility's revenue stream will be insufficient to cover its capital costs. Under this kind of finance system, where capital repayment is based on user charges rather than property taxes, conservation may be viewed as a threat. Telephone interview by Jodi Habush Sinykin with Chuck Ledin, Bureau Director, Office of the Great Lakes (Jul. 25, 2005).

[102]LAMEKA, *supra* note 6, at 29, citing Ben Dziegielewski, Management of Water Demand: Unresolved Issues, Department of Geography, Southern Illinois University (2003).

[103]Utility services that are basic necessities, like water, have been found to be relatively price-inelastic; that is, price changes do not necessarily induce significant usage reductions. David Sheard, Public Service Commission, Presentation to the Groundwater Advisory Committee (Oct. 19, 2005). Nonetheless, a variety of arguments exist in support of increased water pricing, with some advocating for pricing based upon relative water scarcity and others arguing in favor of price adjustments made along a continuum of essential water uses, critical water uses, and discretionary water uses. *Id.* at 29; *see also* Robert Glennon, *The Price of Water*, 24 LAND RESOURCES & ENVTL. L. 337, 340 (2004).

[104]Todd Ambs, Groundwater Advisory Committee Meeting, Madison, Wisconsin (Oct. 19, 2005).

[105]Email from Dan Duchniak, Waukesha Water Utility Manager, to Jodi Habush Sinykin (Oct. 27, 2005) (on file with Midwest Environmental Advocates).

[106]Email from Dave Sheard, Assistant Administrator of the Division of Water, Compliance and Consumer Affairs, Wisconsin Public Service Commission, to Waukesha Water Utility, (Aug. 31, 2005) (on file with Midwest Environmental Advocates).

[107]*Id.*

[108]*Id.*

[109]*See* United Water Delaware, *Customer Billing*, http://www.unitedwater.com/uwde/customer.htm.

[110]United Water Delaware, *Delaware's Water Pricing*, http://www.unitedwater.com/uwde/customer.htm; *see* United Water Delaware, *Conservation Inspiration,* http://www.unitedwater.com/uwde/consrvtn.htm; *see also* Delaware River Basin Commission, http://www.state.nj.us/drbc.

[111]PSC Cost Engineer, Bruce Schmidt, echoed similar concerns at the prospect of a conservation rate structure. In his view, large industry, like Kohler and General Motors, when faced with a flat or inclining rate structure, would simply switch over to a private well, to the detriment of residential customers forced to pay more for their water. *See* Telephone interview with Bruce Schmidt, *supra* note 99. In addition, while the PSC's rate structure applies to municipal customers, according to the DNR roughly two-thirds of Wisconsin's population drinks water drawn from over 750,000 private, non-municipal wells that are not impacted by the PSC rates. *See* http://www.dnr.state.wi.us/org/water/dwg/prih2o.htm; see also B.R. Ellefson, G.D. Mueller, & C.A. Buchwald, Water Use in Wisconsin, 2000, U.S. Geological Survey Open-File Report 02-356, prepared by the U.S. Department of the Interior U.S. Geological Service.

[112]Email from Dave Sheard, *supra* note 106.

[113]City of New Berlin Mun. Code, Chapter 267-4 (C)(7); Telephone interview by Jodi Habush Sinykin with Larry R. Wilms, P.E., Division Engineer-Utilities, City of New Berlin Engineering (Apr. 26, 2005).

[114]Telephone interview with Greg Kessler, Director. of Department of Community Development, City of New Berlin (Apr. 26, 2005).

[115]Under Wis. Stat. § 62.23(7)(a), local municipalities are provided with some limited extraterritorial zoning authority beyond their municipal borders.

[116]Wisconsin's system is one in which the PSC sets the rate structure (currently, declining block rate), while the municipal water utilities set water prices based on the rate, capital needs, and water demand. The PSC then reviews and approves the local price of water.

[117]Paul G. Hayes, *Kettles and Moraines teach Water Conservation.* MILWAUKEE J. SENTINAL, Dec.11, 2004.

[118]*Id; see also* Jim Krohelski, US Geology Survey, *National Assessment of Water Availability and Use, Lake Michigan Basin Study,* Brookfield, Wisconsin (Apr. 27, 2005).

[119]*Id.*

[120]In February 2000, then Secretary of the DNR George Meyer, outlined the DNR's Mid Kettle Moraine policy calling, for local governments to identify outstanding natural areas within the corridor and to protect these resources through zoning laws and incorporation into their Smart Growth plans. The DNR further acted to coordinate the Mid Kettle Moraine project among local governments and citizen groups in Southeastern Wisconsin. *See* Paul G. Hayes., Closing the Gap: *The Mid Kettle Moraine Project,* Mammoth Tales, Ice Age Park & Trail Foundation, Inc., 10:1, Spring 2001.

[121]This collaboration is comprised of the Ice Age Park and Trail Foundation, 1000 Friends, SEWRPC, the DNR, Waukesha and Washington County Parks Departments, the Cedar Lake Conservation Foundation, the Ozaukee-Washington Land Trust, the Waukesha County Land Trust and local government units in the corridor. *See* Paul G. Hayes, *Protecting the Kettle Moraine: A New Land Use Institute,* 1000 Friends Newsletter, 5:3; *see* http://www.1kfriends.org/newsletters/Vol5Num3p4.shtml.

[122]Even more encouraging, according to the Kettle Moraine Task Force's Paul Hayes, these collaborative efforts to date have met with "little or no opposition." *Id.*

[123]Although controversial because the project developed what was formerly open space, another example of local cooperation on a micro-regional level is the Pabst Farms Development's creation of a separate storm-water district to strategize, design, regulate and maintain the development's innovative storm-water management plan. The stormwater plan uses infiltration basins that allow 80% of all rainfall to be infiltrated on-site consistent with pre-development conditions and, as such, could serve as a model to other developments. This storm-water district, comprised of two members from the City of Oconomowoc, two members from the town of Summit, and one member representing Pabst Farms Development, is considered an essential component of the long-term success of the program. *See* Fred Spelshaus & Paul McIllheran, *Successful Stormwater Infiltration at Wisconsin's Pabst Farms,* J. FOR SURFACE WATER QUALITY PROFESSIONALS, http://www.stormh20.com/sw_0405_successful.html; *see also* http://www.nsae.com/pdf/insiteWinter02.pdf.

[124]Interview by Jodi Habush Sinykin with Stephen Born, Emeritus Professor of Planning and Urban Development, University of Wisconsin – Madison, Madison, Wisconsin, referencing studies compiled by Dave Hinds, U-W Local Government Institute.

[125]However, SEWRPC would need to implement reforms internally to ensure the public participation and transparency requisites of Step 2 and would further require additional statutory authority to meet the monitoring and enforcement components of Steps 4–6.

[126]Born, *supra* note 126.

[127]ELLEFSON ET AL, *supra* note 111.

[128]*Id.*

[129]*Id.*

[130]*Id.*

[131]According to the authors of a National Renewable Energy Laboratory report on consumptive water use for US power production, "The total amount of water evaporated seems insignificant compared to the total of water passing through the power plant, but when compared to the amount of energy and water consumed in a typical commercial building or residential home, these values are significant." P. TORCELLINI ET AL., NATIONAL RENEWABLE ENERGY LABORATORY, CONSUMPTIVE WATER USE FOR U.S. POWER PRODUCTION, 1 (2003).

[132]ELLEFSON ET AL, *supra* note 111.

[133] *Id.*

[134]ELLEFSON ET AL, *supra* note 111.

[135]*Id.*

[136]This figure is based on an analysis of 2000 pumpage figures reported by various utilities in Southeastern Wisconsin for each well that it operates. Daily per capita water use was obtained by dividing pumpage figures by the population of each community as reported in the 2000 Census. Pumpage figures include water extracted from the aquifer for all purposes including residential, commercial and industrial uses. In cases where the utility does not supply water to an entire community, as is the case, for example, in New Berlin, the per capita consumption calculated (93.0 gallons per capita per day) is artificially low. A more accurate estimate of per capita groundwater use can be made by examining pumpage figures from utilities that supply virtually an entire community, for example, Brookfield/Elm Grove, Cedarburg, and Grafton among others. Daily per capita water consumption in these communities in 2000 was 95.7 gpd, 134.9 gpd and 123.3 gpd, respectively. Email from Dr. Douglas Cherkauer, Professor, University of Wisconsin-Milwaukee, to Donna McGee (Sept. 11, 2005) (on file with Midwest Environmental Advocates).

[137]*Id.*

[138]VICKERS, *supra* note 8, at 12.

[139]P. W. MAYER ET AL., AMERICAN WATER WORKS ASSOCIATION, RESIDENTIAL END USES OF WATER (1999), http://www.h2ouse.net, *see* "Tour / Toilet Water Use" (on file with Midwest Environmental Advocates), *see also* http://www.everydrop.org.

[140]WAUKESHA WATER UTILITY, ANNUAL REPORT FOR THE YEAR ENDED DECEMBER 31, 2004, at W-16 (2005). Note that the single largest withdrawal of 10,483,000 gallons occurred on September 13, 2004. By comparison, the utility pumped only 52% as much water on May 30, 2004, its lowest daily pumpage for the year.

[141]ELLEFSON ET AL, *supra* note 111.

[142]WAUKESHA WATER UTILITY, *supra* note 140, at W-2.

[143]*Id.*

[144]These figures were obtained by taking gallons of water sold by the City of Waukesha Water Utility, as reported in its 2004 Annual Report, to residential, commercial and industrial customers and diving these figures by the average number of residential, commercial and industrial customers, respectively, provided in this same report. WAUKESHA WATER UTILITY, *supra* note 140, at W-2.

[145]VICKERS, *supra* note 8, at 230-231.

[146]ELLEFSON ET AL, *supra* note 111.

[147]*Id.*

[148]OFFICE OF WATER, U.S. ENVTL. PROT. AGENCY, CASES OF WATER CONSERVATION: HOW EFFICIENCY PROGRAMS HELP WATER UTILITIES SAVE WATER AND AVOID COSTS 15 (2002).

[149]WAUKESHA WATER UTILITY, *supra* note 140, at W-16.

[150]MINN. DEP'T OF ENVTL. PROT., REDUCING PEAK DAY DEMANDS CAUSED BY LAWN WATERING (2001), *see* http://www.dnr.state.mn.us/waters (on file with Midwest Environmental Advocates).

[151]VICKERS, *supra* note 8, at 140.

[152]VICKERS, *supra* note 8, at 5-6.

[153]VICKERS, *supra* note 8, at 7.

[154]LAMEKA, supra note 6, at 21.

[155]*See* VICKERS, *supra* note 8, at 12-133 (detailed information on residential and domestic water use and efficiency measures can be found in Chapter 2).

[156]VICKERS, *supra* note 8, at 183-184.

[157]VICKERS, *supra* note 8, at 162-163.

[158]VICKERS, *supra* note 8, at 176.

[159] http://www.region.waterloo.on.ca, *see*, "About the Region" (on file with Midwest Environmental Advocates).

[160]*Id., see* "Water Supply in Waterloo Region" (on file with Midwest Environmental Advocates).

[161]REBECCA LAMEKA, GREAT LAKES COMMISSION, REGIONAL CASE STUDIES: BEST PRACTICES FOR WATER CONSERVATION IN THE GREAT LAKES – KT. LAWRENCE REGION 17-19 (2004).

[162]REGION OF WATERLOO, TRANSP. AND ENVTL SERVICES REPORT E-04-127, 1 (Sept. 2004).

[163]Id. at 1-2.

[164]REGION OF WATERLOO, TRANSP. AND ENVTL SERVICES 2003 WATER EFFICIENCY PROGRAMS SUMMARY REPORT, E-04-039, 2-7 (Feb. 2004).

[165]Results and Water Savings as reported in 2003 are as follows:
- Over 35,000 1.6/1.0 toilets were installed since 1994 resulting in a cumulative water savings since 1998 of 814,700 gallons per day – enough water to serve 4,000 households.
- 711 1.6 gpf toilets were installed in the Village of Ayr, representing 38.7% of inefficient toilets, for a total daily water savings of approximately 100 cubic meters (approximately 26,417 gallons) – enough to supply the average needs of 110 households.
- 17,045 rain barrels were distributed over the first three years of the program for an estimated cumulative annual water savings of 20,454 cubic meters (approximately 5.4 million gallons) – enough to fill 601 swimming pools.
- The number of students exposed to the educational curricula each year is difficult to track – it appears as if at least 1050 second grade students were exposed.
- Research identified that strong market forces were driving consumers to switch to efficient, front loading washers without rebate incentives.
- Updates to Regional Facilities are numerous and ongoing, including the design of the EMS Fleet Centre which includes waterless urinals, duel flush toilets, drought resistant landscaping and a rainwater cistern, the testing of waterless urinals and the pilot installation of 51 duel flush toilets in the Region's housing units.
- It is estimated that over 3,652 Waterloo residents were reached in 2003 through displays, presentations, activities and events, as well as an additional 4,000 students at the Children's Groundwater Festival and 5,000 people at rain barrel day.
- During Stage 2 outdoor water restrictions, water services staff patrolled and delivered information directly to the public and issued over 100 warnings.
- In 2003, a water use efficiency audit was completed at Cambridge Memorial Hospital. Estimated water savings from installing water efficient toilets and retrofitting toilets alone are expected to save 9,400 cubic meters (approximately 2.5 million gallons) of water and save $14,000 annually on water bills.

Source: REGION OF WATERLOO, *supra* note 164, at 1-11.

[166]REGION OF WATERLOO, *supra* note 162, at 2-3.

[167]VICKERS, *supra* note 8, at 152-153 (for a detailed discussion of landscape water use and efficiency measures, *see* Chapter 3).

[168]Vickers, *supra* note 8, at 235.

[169]*Id.*

[170]VICKERS, *supra* note 8, at 332.

[171]ELLEFSON ET AL, *supra* note 111.

[172]The highest water efficiencies (90–98%) result from a low energy precision application combined with the use of furrow dikes VICKERS, *supra* note 8, at 333, 339.

[173]VICKERS, *supra* note 8, at 332-334.

[174]VICKERS, *supra* note 8, at 6.

[175]DAVID CURWEN AND LEONARD R. MASSIE, UNIVERSITY OF WISCONSIN – SXTENSION, IRRIGATION MANAGEMENT IN WISCONSIN – THE WISCONSIN IRRIGATION SCHEDULING PROGRAM (WISP) 1-3.

[176]Id. at 3.

[177]See http://www.soils.wisc.edu/wimnext/water.html.

[178]The Wisconsin Potato & Vegetable Growers Association (WPVA) collaborates with the World Wildlife Fund and the University of Wisconsin's Integrated Pest Management Practices research team in order to develop and promote farming systems which are safe for the environment. Early studies by these groups resulted in the development of the Wisconsin Irrigation Scheduling Program (WISP) – a program promoting efficient irrigation and energy use. The WISP software is available as part of the above-mentioned software distributed by WPVA to its members; see http://www.soils.wisc.edu/wimnext/water.html; see also Telephone interview by Donna L. McGee with Scott Sanford, Department of Biological Systems Engineering, University of Wisconsin-Madison (Oct. 27, 2005).

[179]CURWEN, *supra* note 175, at 1-3.

[180]TORCELLINI ET AL, *supra* note 131, at 1.

[181]TORCELLINI ET AL, *supra* note 131, at 9.

[182]SUSAN S. HUDSON ET AL, U.S. DEP'T OF THE INTERIOR, ESTIMATED USE OF WATER IN THE UNITED STATES IN 2000, 1269 U.S. Geological Survey Circular 35 (2004).

[183]Id. at 39

[184]TORCELLINI ET AL, *supra* note 131, at 9.

[185]Id.

[186]Telephone interview with Duane Schuettpelz, *supra* note 17.

[187]TORCELLINI ET AL, *supra* note 131, at 10.

[188]NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, PROGRAM FACTS: INNOVATIVE APPROACHES AND TECHNOLOGIES FOR IMPROVED POWER PLANT WATER MANAGEMENT 1-2 (2004).

[189]*Id*. at 10.

[190]*Id.*

[191]*Id.* at 1-4.

[192]Ed Brown, *Renewable Energy Brings Water to the World,* WATER OBSERVATORY, Aug. 23, 2005, http://www.waterobservatory.org/headlines.cfm?refid=76801 (on file with Midwest Environmental Advocates).

[193]U.S. ENVTL. PROT. AGENCY, *supra* note 48 at 32.

[194]Cherkauer & Ansari, *supra* note 47, at 102-112.

[195]U.S. ENVTL. PROT. AGENCY, *supra* note 48, at 2.

[196]*Id.* at 8.

[197]REUSE COORDINATING COMMITTEE, THE WATER CONSERVATION INITIATIVE & WATER REUSE WORK GROUP, WATER REUSE FOR FLORIDA: STRATEGIES FOR THE EFFECTIVE USE OF RECLAIMED WATER 3 (2003); FLA. STAT. chs. 373.250, 403.064 (2005), http://www.leg.state.fl.us/Statutes.

[198]REUSE COORDINATING COMMITTEE, *supra* note 197, at 15-29; FLA. STAT. chs. 373.250, 373.1961, 367.0817(3), 403.135, 403.086(7) (2005), http://www.leg.state.fl.us/Statutes.

[199]REUSE COORDINATING COMMITTEE, *supra* note 197, at 27.

[200]*Id.* at 15. FLA. STAT. ch. 403.064 (2005).

[201]Member agencies of the Reuse Coordinating Committee include the Florida DEP, the five WMDs, the Public Service Commission, the Department of Health, the Department of Agriculture and Consumer Services, the Department of Community Affairs and the Department of Transportation. REUSE COORDINATING COMMITTEE, *supra* note 197, at 25.

[202]*Id.* at 26.

[203]Email from Lauren Walker-Coleman, Reuse Specialist, Fla. Dep't of Envtl. Prot., to Donna McGee (May 24, 2005) (on file with Midwest Environmental Advocates).

[204]REUSE COORDINATING COMMITTEE, *supra* note 197, at 16, 25-26; FLA. STAT. ch. 403.064 (2005), http://www.leg.state.fl.us/Statutes.

[205]REUSE COORDINATING COMMITTEE, *supra* note 197, at 16; FLA. STAT. ch. 403.064 (2005), http://www.leg.state.fl.us/Statutes.

[206]REUSE COORDINATING COMMITTEE, *supra* note 197, at 15, 18-20; FLA. STAT. ch. 403.064 (2005); FLA. ADMIN. CODE chs 62-600, -601, -610, -40, -620 (2005), http://fac.dos.state.fl.us/faconline/chapter62.pdf.

[207]Reclaimed water use in Florida in 2004 broke down as follows: landscape irrigation / public access areas – 49%, Agriculture – 14%, Ground Water Recharge – 16%, Industrial Uses – 14%, Wetlands and other uses – 7%. DIV. OF WATER REUSE MGMT., FLA. DEP'T OF ENVTL. PROT., 2004 REUSE INVENTORY 10, 12 (2005).

[208]*Id.* at Table 4.

[209]Email from Lauren Walker-Coleman, Reuse Specialist, Fla. Dep't of Envtl. Prot., to Donna McGee (September 8, 2005) (on file with Midwest Environmental Advocates); DIV. OF WATER REUSE MGMT., *supra* note 207 at Appendix E and I.

[210]RESOURCE COORDINATING COMMITTEE, *supra* note 197, at 43-54.

[211]The chart is not intended to provide a comprehensive description of each highlighted city's conservation plans, but rather to illustrate the wide variety of conservation measure in place throughout the United States. Many of the below mentioned programs are extensive and multi-faceted and contain measures and incentives not discussed. Contact information and web addresses are provided in Appendix D for each of the listed programs and we encourage readers to learn more about each of the conservation programs highlighted. Unless otherwise noted, the information included in the below chart was found on the websites listed in Appendix D as of May 2005 and is on file with Midwest Environmental Advocates. For more in-depth descriptions of conservation programs in 17 different communities, *see* OFFICE OF WATER, *supra* note 148. For a brief summary of water conservation incentives (mostly technical/mechanical) in place in 27 cities, *see* OFFICE OF POLICY DEV. AND RESEARCH, U.S. DEPT. OF HOUSING AND URBAN DEV., OVERVIEW OF RETROFIT STRATEGIES: A GUIDE FOR APARTMENT OWNERS AND MANAGERS, APPENDIX B (2002). For case studies of Albuquerque, NM, Southwest Florida Management District, the State of California, the City of Calgary, Alberta, Canada, Fukuoka City, Japan, Western Australia and Israel, *see* LAURA E. KAMINSKI, GREAT LAKES COMMISSION, PUBLIC SECTOR WATER CONSERVATION: TECHNOLOGY AND PRACTICES OUTSIDE THE GREAT LAKES – KT. LAWRENCE REGION (2004).

[212]Information on the City of Seattle's internal conservation programs was found on the website listed in Appendix D as of September 12, 2005, and is on file with Midwest Environmental Advocates.

[213]Information on the programs described was obtained from the various websites indicated in Appendix D as of early May 2005 and is on file with Midwest Environmental Advocates. Contact information for the above mentioned programs can also be found in Appendix D.

[214]Adapted from VICKERS, *supra* note 8, Chapter 1.

Midwest Environmental Advocates is a non-profit environmental law center that provides legal and technical assistance to communities working for clean air, clean water, and a clean government. Our mission is to provide high-quality legal services that support a multicultural, grassroots social movement; build local leadership; and develop innovative solutions to environmental problems.

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