MINUTES OF THE NINTH MEETING
SEWRPC REGIONAL WATER SUPPLY PLANNING ADVISORY COMMITTEE

DATE: October 11, 2006
TIME: 9:00 a.m.
PLACE: Lower Level Conference Room
Regional Planning Commission Offices
W239 N1812 Rockwood Drive
Waukesha, Wisconsin

MEMBERS PRESENT

Kurt W. Bauer, Chairman Executive Director Emeritus, SEWRPC
Robert P. Biebel, Secretary Special Projects Environmental Engineer, SEWRPC
Julie A. Anderson Director, Racine County Division of Planning and Development
Kenneth R. Bradbury Hydrogeologist/Professor, Wisconsin Geological
and Natural History Survey
Thomas J. Bunker General Manager, Water and Wastewater Utility, City of Racine
Lisa Conley Representative, Town and Country Resource
Conservation and Development, Inc.
Michael P. Cotter Director, Walworth County Land Use and
Resource Management Department
Daniel S. Duchniak General Manager, Waukesha Water Utility, City of Waukesha
Thomas M. Grisa Director of Public Works, City of Brookfield
Jeffrey A. Helmuth Hydrogeologist Program Coordinator, Wisconsin
Department of Natural Resources, Madison
Roger C. Johnson Manager, North Shore Water Commission
Carrie M. Lewis Superintendent, Milwaukee Water Works, City of Milwaukee
Patrick T. Marchese Member, Water Policy Advisory Panel, Public Policy Forum
George E. Melcher Director, Kenosha County Department of Planning and Development
Matthew Moroney Executive Director, Metropolitan Builders Association
of Greater Milwaukee
Paul E. Mueller Administrator, Washington County Planning and Parks Department
Jeffrey Musche Administrator/Clerk, Town of Lisbon
Michael P. Rau General Manager, We Energies-Water Services
Dale R. Shaver Director, Waukesha County Department of Parks and Land Use
James Surfus Senior Environmental Engineer, Miller Brewing Company
Daniel S. Winkler Director of Public Works and Utilities, City of Lake Geneva
Steven N. Yttri General Manager, Water and Sewer Utility, City of Oak Creek

MEMBERS EXCUSED OR OTHERWISE ABSENT

Douglas S. Cherkauer Professor of Hydrogeology, University of Wisconsin-Milwaukee
Charles A. Czarkowski Regional Water Program Expert, Wisconsin Department
of Natural Resources, Southeast Region
Charles P. Dunning Hydrologist, U.S. Geological Survey
Franklyn A. Ericson Manager, Environmental Operations & Central Services,
S.C. Johnson & Son, Inc.
CALL TO ORDER AND ROLL CALL

Chairman Bauer called the meeting to order at 9:00 a.m. Roll call was taken by circulating an attendance signature sheet, and a quorum was declared present.

CONSIDERATION OF MINUTES OF THE MEETING OF AUGUST 30, 2006

Chairman Bauer noted that copies of the minutes of the August 30, 2006, meeting of the Regional Water Supply Planning Advisory Committee had been provided, to all members of the Committee for review prior to the meeting, and asked that the Committee consider approval of those minutes.

Chairman Bauer reminded the Committee members that all of the revisions which were requested by the Committee to be made in the materials reviewed at that meeting were intended to be fully documented in the minutes, or in attachments thereto. He reminded the Committee members that approval of the minutes would constitute final approval of Chapter IX, “Design Standards,” of SEWRPC Technical Report No. 43, State-of-the-Art of Water Supply Practices. He noted that the approval would, of course, be subject to any comments received today on the minutes and the attachments thereto.

Mr. Grisa referred to the section added to Chapter IX on pages 1 and 2 covering the topic of water supply sustainability analysis. In the sentence of the third paragraph on page 1, he questioned the use of the word “all,” referring to the portion of the spent water returned to Lake Michigan. It was agreed to substitute the word “most” for “all” in that sentence.

Mr. Grisa also referred to the sixth sentence in the third paragraph on page 1, and questioned whether the statement that no groundwater source was fully sustainable was correct. He opined that the shallow aquifer which was readily recharged could be sustained at some level of use. Mr. Biebel responded that the use of groundwater from the shallow aquifer would typically result in a loss of that water that
typically discharges to the surface waters. Thus, true sustainability would not be achieved even if groundwater levels were maintained. Mr. Bradbury agreed, noting that groundwater pumped from the aquifer would change the hydrologic system involved.

Mr. Schultz noted that the definition of sustainability had previously been developed which could be referenced. Chairman Bauer agreed with Mr. Grisath that with proper management, it should be possible to achieve a sustainable condition in an aquifer and recommended that the text be revised.

[Secretary’s Note: The third paragraph on page 1 has been revised to read as follows:

“Water supply sources have limits on their ability to sustain the demand placed upon them over time without potential unacceptable changes in the aquifer and its encompassing hydrologic environment. For surface water systems in the Southeastern Wisconsin Region, a source of supply sustainability evaluation has not been a major consideration, given the size of the resource compared to the uses, and given the return of most spent water to the source of supply. For groundwater supplied systems, a water supply source sustainability evaluation is an important part of the water supply planning process. As the demand for water from an aquifer increases, there is a possibility that it may exceed the ability of the aquifer to meet this demand without unacceptable changes, such as the decline in water tables. For this reason, sound water supply planning requires that the sustainable capacity of an aquifer be evaluated considering the projected water uses and demands and the management measures to be incorporated into the water supply system. Any use of groundwater theoretically reduces the amount of groundwater or its contribution to surface waters. Thus, the definition of the term “sustainability”\(^1\) is a key consideration in any analyses directed toward achievement of “sustainability.” Ideally, such an analysis should include an evaluation of groundwater-surface water impacts, as well as groundwater recharge and level maintenance.

\(^1\)For purposes of the regional water supply planning program, sustainability has been defined in Chapter V of SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, as the beneficial use of water supply resources in such a way that those resources support the current and probable future needed uses, while simultaneously ensuring that the resources are not unacceptably damaged by such a beneficial use.”]

Mr. Grisath referred to Tables IX-2, IX-3, and IX-4 and asked if the unaccounted-for water was a weighted average. Mr. Biebel responded in the affirmative, and indicated that the tables would be footnoted to reflect that calculation procedure. Mr. Grisath also referred to Figures IX-1, IX-2, and IX-3 and suggested that the red portion of the pie charts should be indicated to include commercial water uses. Mr. Biebel indicated that the suggested change would be made.

Ms. Conley suggested that the unaccounted-for water be added to the pie charts in Figures IX-1, IX-2, and IX-3. Ms. Lewis indicated that the figures were effective as presented, indicating as they did the proportions of water used for categories which were very specifically accounted for by metering and other means. She indicated that the estimates of unaccounted-for water were not developed in any a consistent manner by the various utilities concerned, and were, in any case, variable from year to year. She indicated
that the method of estimating unaccounted-for water was somewhat subjective and that good practice
would not attempt to integrate unaccounted-for water with specifically determined water uses. A brief
discussion ensued in which Mr. Bunker noted that the issue of unaccounted-for water was an issue that
the water industry was treating as an important one that needs to be addressed as the primary means for
achieving efficiency in water system operations versus the benefits which might be achieved by other
water conservation measures. Mr. Schultz responded that the water industry presently recommended
considering unaccounted-for water as it relates to acceptable costs, rather than attempting to define an
acceptable set amount, or percentage, of total pumping as an objective. Upon conclusion of the
discussion, it was agreed that the staff would review and revise the text to address this issue.

[Secretary’s Note: The first two paragraphs under the heading “Unaccounted-for Water” on
page 5 of the revised Chapter IX were revised to read as follows:

“Water that is metered, together with that which is not metered, but
estimated, comprises the total customer “demand” for water. Unaccounted-
for water may be defined as that water which is supplied by pumping
facilities to the distribution system, but is not accounted for by metered or
estimated delivery to users. This may include water which is delivered, but
not metered due to meter inaccuracies, system leakage, unrecorded water
main flushing, unaccounted-for losses associated with water main breaks or
storage tank overflows, water theft, and unrecorded firefighting. The amount
of unaccounted-for water is an important consideration for water utilities
since, to the extent that it can be minimized, it represents an opportunity for
an effective reduction in water supply requirements.

Estimates of unaccounted-for water should be reviewed annually to
determine the percentage of lost pumpage. The PSC regulations require that
the estimated unaccounted-for water not exceed 25 percent of station
pumpage for smaller utilities, and not more than 15 percent for larger
utilities. If unaccounted-for water is in excess of these percentages, a water
audit should be performed by the utility. Water audits generally consist of
leak detection activities for smaller utilities, and a combination of
mathematical analyses, systemwide use monitoring, and leak detection
activities for larger utilities. All utilities should routinely check water meters
for accuracy in accordance with PSC regulations. Systems with ongoing
leakage problems should have an annual leak detection program combined
with an aggressive water main maintenance and replacement program.
Ideally water utilities should strive for minimization of unaccounted-for
water. Water systems with 10 to 15 percent unaccounted for water are
generally considered to be performing well, and distribution system losses
of 10 to 20 percent are generally considered reasonable.

2 Wisconsin Administrative Code, PSC 185.85 (4).

3 L.M. Bennevelli, Accounting for Unaccounted-for Water, Four, NEWWA,
93:2:258-266, September 1978.

4 C.W. Keller, Analysis of Unaccounted-for Water, Four, AWWA, 68:3:159-
162, March 1976.”]
There being no further corrections or additions, the minutes of the meeting of August 30, 2006, were approved as amended on a motion by Mr. Marchese, seconded by Mr. Moroney, and carried unanimously.

CONSIDERATION OF CHAPTER III, “EXISTING WATER SUPPLY CONDITIONS IN THE REGION,” OF SEWRPC PLANNING REPORT NO. 52

Chairman Bauer then asked the Committee to consider Agenda Item 3. He noted that all Committee members had received a copy of Chapter III, “Existing Water Supply Conditions in the Region,” of SEWRPC Planning Report No. 52 for review prior to the meeting. Chairman Bauer reminded the Committee that pages 97 through 137 of Chapter III had been reviewed and approved at earlier meetings. That review had covered the sections of the chapter on water supply system history, sources of supply, and the findings of the water supply systems inventory for Kenosha County. He noted the materials to be reviewed today would be the findings of the water supply systems inventories for the other six counties. He noted further that following today’s review of the remaining substantive sections of the chapter, a summary of the chapter would be prepared for presentation at the next meeting. That summary would also be included as Chapter II of the state-of-the-art report. He then asked Mr. Biebel to review the chapter with the Committee on a page-by-page basis.

Mr. Biebel reminded the Committee that the tabular data on other than municipal water supply facilities was now presented in Appendix E. He indicated that such a method of presentation had been agreed to at the meeting during which the Kenosha County inventory had been reviewed.

The following questions were raised, comments made, and actions taken in the course of the review.

Mr. Grisa referred to Map 33 and noted that the City of West Milwaukee was mapped to indicate it was not a retail customer of the City of Milwaukee. However, the footnotes indicate that the City of West Milwaukee is a City of Milwaukee retail customer. Ms. Lewis reported that the situation with respect to the City of West Milwaukee is unusual, in that the City of Milwaukee provides retail service, but does not maintain the City of West Milwaukee distribution system, as is the case with other retail customers. It was agreed to change Map 33 and the related text to clarify the water service situation in the City of West Milwaukee.

[Secretary’s Note: Map 33 has been revised to indicate that the situation in the City of West Milwaukee is unique with respect to provision of water supply. The associated text on page 139 was also revised accordingly.

In addition, the terms “retail water service” and “wholesale water service” were added to Appendix C as follows:

“Retail Water Service: An arrangement whereby customer communities receive full service from a water supplier, including the provision of treated water, customer billing, and distribution system operation and maintenance.

Wholesale Water Service: An arrangement whereby customer communities purchase treated water and provide it to their customers through their own water utilities, retaining responsibilities for operation of its water system, including customer billing and...
Ms. Lewis questioned the population served for the City of Milwaukee system, as identified in Table 34. Mr. Biebel indicated that the population was intended to represent the population residing in the retail service area and did not include the population residing in the wholesale water service areas. It was agreed to footnote Table 34 to clarify this matter.

Ms. Lewis referred to the second paragraph on page 143 regarding water conservation measures in place. She indicated that the City of Milwaukee had conducted comprehensive leak surveys and had instituted a program to reduce the length of backwash cycles at the two Milwaukee water treatment plants. It was agreed to add these measures to the text. Mr. Grisa indicated that he had provided a list of water conservation measures to be added to the list for the City of Brookfield. He noted that some of these measures were likely being carried out by all water utilities, and should be noted in the text.

In addition, while not specifically reported, all of the utilities may be expected to be working to improve efficiency and minimize water losses in their systems. Such measures include meter testing for accuracy, leak detection programs, and repair of water main breaks and leaks. In addition, all of the water supply utilities within southeastern Wisconsin have water metering in place, have billing systems based upon usage, and are governed by the State plumbing code which limits flow rates and volumes for plumbing fixtures.

In addition, the first sentence in the second paragraph on page 143 regarding water conservation measures for Milwaukee County communities has been revised to read as follows:

“Water conservation measures reported to be in place by the water utilities in Milwaukee County which have water treatment plants include the City of Milwaukee practice of providing assistance to water users in identifying and eliminating leaks in internal plumbing systems, the conduct of a comprehensive leak survey, and efforts to reduce the length of the filter backwash cycles at the water treatment plants.”

Mr. Yttri referred to Table 34 and indicated that the population level indicated to be served for the City of Franklin appeared to be low. Mr. Biebel agreed to check the reported data.

A review of the population served for the City of Franklin Water Utility and the other utilities in Milwaukee County indicated that the City of Franklin and adjacent community population served numbers should, indeed, be revised. The revision related to the change in population between the Census years 2000 and 2005. It was determined that the increase in population served by public water increased at a greater rate that the general population increase. A copy of revised Table 34 is attached hereto as part of Exhibit A.
Ms. Conley referred to the last sentence of the third full paragraph on page 144 which included statements on the discharge of spent water from the Milwaukee County water utilities. She recommended that the same information be provided for all of the water utilities, noting, in particular, the discharge of spent water from the Lake Geneva utility to the groundwater system. Mr. Grisa noted that simply identifying the receiving water for the spent water supplies would not reflect all of the considerations involved in balancing water use and source supply. He noted, for example, the effect of increased stormwater runoff volumes due to urban development which are discharged to surface waters. Mr. Bunker agreed, noting that calculating a water balance involving water use and spent water return would not be possible, due to such factors as clearwater infiltration and inflow into sanitary sewers and combined sewer flows.

Mr. Biebel indicated that the City of Lake Geneva wastewater treatment plant effluent was discharged to seepage cells which infiltrated the effluent into the ground. However, he said, the groundwater flowed eastward toward and discharged to a tributary of the White River, and no water supply wells were located between the seepage cells and the tributary that received the groundwater discharge. He indicated that the primary purpose of the system was to dispose of wastewater, not to recharge the aquifer. He noted that if the later were to be the purpose for a similar system, then higher treatment levels would have to be met. He indicated that most wastewater discharges to the groundwater system in the State functioned in a similar manner to the Lake Geneva system, with the primary function being wastewater disposal, not aquifer recharge. Mr. Winkler agreed, but stated that a study was done for the City indicating that over time—about 16 or more years—some of the discharged wastewater may reach the cone of influence for one of the City’s wells, albeit highly diluted.

A brief discussion ensued, upon the conclusion of which, it was agreed to add a column to each of the county tables which contained selected characteristics of the existing water supply systems to indicate the receiving water system for the community’s spent water, but that no attempt should be made to quantify the amounts of spent water returned to the various surface and groundwater bodies concerned.

[Secretary’s Note: Revised copies of Tables 32, 34, 36, 38, 40, 42, and 44 incorporating the spent water receiving system are attached hereto as Exhibit A.]

Mr. Rau referred to the fourth paragraph on page 148 regarding water system interconnections. He noted that there was an emergency use interconnection between the We Energies-Water Services system serving the Village of Bayside and the City of Mequon-Village of Thiensville system.

[Secretary’s Note: To reflect this interconnection, the fourth paragraph on page 148 has been revised to read as follows:]

As previously reported, We Energies-Water Services, which purchases treated surface water from the City of Milwaukee Water Works, supplies water to portions of the City of Mequon and the Village of Thiensville. Thus, the We Energies-Water Services water supply is connected to the City of Milwaukee system. The We Energies-Water Services system serving the City of Mequon and Village of Thiensville is also interconnected for emergency use purposes to the We Energies-Water Services system which serves portions of the Village of Bayside and is supplied by the North Shore Water Commission system. In addition, the City of Cedarburg and Village of Grafton have a water supply system interconnection at one location in order to provide system redundancy and emergency provisions.”]
Ms. Lewis referred to the last paragraph on page 154 regarding thermoelectric-power generation facilities and recommended that the water use be quantified to the extent possible. Mr. Biebel replied that would be done if the data were available.

[Secretary’s Note: In response to the recommendation, the last paragraph on page 154 was revised to read as follows:

“Existing Thermoelectric-Power Generation Water Supply Systems
In 2005, the Port Washington Power Plant, located in the City of Port Washington, began conversion from a coal-fired thermoelectric-power-generation to an intermediate load natural gas-fired facility. This facility draws water from Lake Michigan and uses an open cycle cooling system which passes the water over heat exchangers and then returns the water to its source. Based upon a 2001 Wisconsin Department of Natural Resources environmental impact statement, the maximum total water withdrawal rate from the Lake for cooling the proposed facility is estimated to be 560,000 gpm. Of this total, approximately 535,000 gpm would be passed through the condensers and other heat exchange equipment. Another 25,000 gpm would be used to improve the combustion turbine operating efficiency during warmer weather by cooling the intake air by passing it over coils containing once-through circulating lake water.

The Port Washington power plant’s existing water intake structure was designed with a capacity of 565,000 gpm, which is expected to be adequate for the proposed new plant configuration. We Energies reported that during the period 1996 through 1998, the average and maximum flow rates through the cooling system were 293,000 gpm and 440,000 gpm, respectively.

Two new 150,000-gallon demineralized water storage tanks are proposed to be constructed to store water for use as steam-cycle makeup. The existing demineralizer plant, consisting of two trains, each with a capacity of 150 gpm, would be used to produce demineralized water for the new facility. The existing municipal water supply source would be used for potable uses, back-up fire protection, and for providing makeup to the demineralizer system.”

In addition, the last paragraph on page 182 was revised to read as follows:

“Existing Thermoelectric-Power Generation Water Supply Systems
In 2005, there was one existing privately owned, self-supplied, water system operating in Washington County which provided cooling water for a thermoelectric-power-generation facility. This facility was a combustion turbine generating facility located in the Village of Germantown. The Germantown power plant was constructed in 1978 and expanded in 2000. The facility utilizes groundwater obtained through a well with an approved pump capacity of 500 gallons per minute, and an approved well capacity of 100,000 gallons per day. This well was finished in the deep sandstone aquifer. The amount of water used varies annually depending upon the need for the intermittent operation of the peaking facility. The water use for the only years reported, 1982 through 1989, averaged 220,000 gallons per year, or about 600 gallons per day.”]
Mr. Bunker referred to Map 37 and asked if the maps was meant to depict the areas served at a specific point in time, that being 2005. Mr. Biebel indicated in the affirmative, noting that similar maps would be included in Chapter VI which would show planned 2035 service areas. Mr. Bunker noted that the Village of North Bay should be shown as served on Maps 37 and 39. Mr. Biebel indicated that the maps would be corrected.

Mr. Bunker recommended, and the Committee concurred, to delete the identification of the storage facilities on Maps 31 and 38.

Mr. Yttri referred to Map 37 and noted that portions of the North Park Sanitary District and the Crestview Sanitary District were provided with water by the City of Oak Creek, with the remaining surface water supplies provided by water from the City of Racine. He recommended that this be reflected on the map. The Committee concurred.

Ms. Conley referred to the text on page 171 regarding a new well proposed to be constructed by the Village of East Troy. She recommended that the text be expanded to indicate the controversial issues involved in that well siting.

[Secretary’s Note: The following last sentence in the third paragraph on page 171 was replaced by the following text:

“The siting of this well was controversial because of potential impacts on the groundwater discharges to surface waters, including Lake Beulah. The well development was the subject of legal action and negotiations involving the Village, the Lake Beulah Lake Management District, and the Lake Beulah Protective and Improvements Association. As of late 2006, the legal action was concluded, with the Village proceeding with well construction. Discussion continued between the parties involved regarding well pumping protocols. The Village is also developing the facilities needed to establish a higher pressure zone and booster pumping station to serve areas of urban development located south of IH 43.”]

Mr. Winkler referred to Maps 40 and 41. He noted that the City of Lake Geneva Municipal Water Utility currently provides water to the Big Foot Beach State Park and that Maps 40 and 41 should be adjusted accordingly. The maps have been amended as necessary.

Mr. Mueller noted that the Village of Jackson serves the St. Joseph Community Hospital in the Town of Polk. Maps 42 and 43 have been amended as necessary.

Mr. Shaver referred to Map 45 and the text on pages 197 through 198 regarding private self-supplied water systems. He recommended that the tabular data in Appendix E be checked as the number of symbols for the agricultural self-supplied systems did not appear to be consistent with the tabular data in Appendix E. He also suggested a better cross-reference between the maps and the tabular data.

[Secretary’s Note: Map 45 has been revised to clarify that the symbols on the map designate self-supplied wells, as opposed to water supply systems. For example, there are 37 agricultural wells providing water for 12 agricultural systems. There are 37 symbols on the map. In addition, the text for each of the paragraphs on the self-supplied systems has been revised to reference the table in Appendix E which is the appropriate source for the different types of facilities. This was done for the text relating to each county.]
Ms. Conley referred to Maps 44 and 45, indicating that the northern shoreline of Lac La Belle was not served by public water. The change was duly noted.

Mr. Grisa referred to Map 44 and noted that the portion of New Berlin east of the subcontinental divide should be shown as being served by surface water.

Ms. Lewis referred to the second to last sentence of the first full paragraph on page 187. She recommended, and it was generally agreed, to clarify that the relatively small service areas in Menomonee Falls which are located west of the subcontinental divide and are served with Lake Michigan water were also connected to the Milwaukee Metropolitan Sewerage District sewerage system.

[Secretary’s Note: The following sentences were added ahead of the last sentence in the first full paragraph on page 187:

“The small portions of the Village of Menomonee Falls water service area located west of the subcontinental divide and served with Lake Michigan water through the City of Milwaukee system are all connected to the Milwaukee Metropolitan Sewerage District sewerage system. Thus, the spent water is returned to Lake Michigan following treatment.”]

Mr. Grisa referred to the first full paragraph on page 189 which described the City of Brookfield plans for water supply. He indicated that he had provided comments directly to the Commission staff which revised the Brookfield planned water supply section. In addition, he recommended that the words “as the need arises” be deleted from the end of the second sentence in the first full paragraph on page 189. He indicated that it was planned to convert all of the private wells to a public system by about the year 2025. The suggested changes were duly made.

Mr. Grisa referred to the first full paragraph on page 188 covering water conservation measures in Waukesha County. He noted that Waukesha County had recently initiated a water conservation education initiative which should be referenced. Mr. Shaver agreed, indicating he would provide supporting materials in that effort.

[Secretary’s Note: Subsequent to the meeting, Mr. Shaver provided materials on the Waukesha Water Conservation Coalition, including information on its mission, target audience, and initial components. Based upon that information, the following paragraph has been added after the first full paragraph on page 188:

“During 2006, Waukesha County and the City of Waukesha organized a Water Conservation Coalition to prepare and help implement a water conservation education program. The initially identified mission of the Coalition was to develop an awareness of groundwater use-related issues, and of demand side conservation measures through areawide collaborative efforts. The target audience envisioned include, county and municipal officials, businesses leaders, and the general public. The initially identified components of the public awareness program include:

1. Develop and deliver educational materials and programs that enable individuals to safeguard their own drinking water (primarily private, nonregulated supplies);
2. Encourage municipalities and water users to develop and adopt water conservation plans, which include systemwide demand reduction goals;

3. Develop and deliver a demand side conservation awareness strategy to assist municipalities and water users in achieving systemwide demand reduction goals or in achieving demand side reduction measures identified in the regional water supply plan;

4. Develop outcome assessments for each of the educational initiatives; and

5. Encourage land development patterns that lead to a sustainable water supply.”]

Mr. Marchese referred to the second to last sentence in the fourth paragraph on page 190. He recommended, and it was agreed, to delete the words “this options appears viable since” from the sentence. He also recommended, and it was agreed, that the text of the same paragraph be clarified as to the area for which the City was considering a Lake Michigan supply option.

[Secretary’s Note: The sixth sentence in the fourth paragraph on page 190 has been revised to read as follows:

“The options which are being considered include obtaining Lake Michigan surface water to serve the remainder of the water service area, all of which is currently provided with sanitary sewer service by connection to the Milwaukee Metropolitan Sewerage District sewerage system. Thus, all the spent water would be conveyed to Lake Michigan following treatment. Other options being considered are treatment of water from some of the wells, and modification or abandonment of certain wells.”]

Mr. Shaver referred to the last paragraph on page 198 and asked if there was a reference source for the estimate that 90 percent of the water withdrawn by private wells was returned when the onsite wastewater disposal systems were used. Mr. Biebel indicated that he was unaware of a specific reference for that value. It was agreed that the Commission staff would investigate that matter.

[Secretary’s Note: The Commission staff reviewed the available literature related to the design and operation of onsite sewage disposal systems. No information was found related to the proportion of water use discharged to onsite sewage disposal systems, and from such systems into the groundwater reservoir. One way to estimate that percentage is to review the water uses in a typical residence and consider the fate of the water for each use. A typical end use composition for a single-family water demand is as follows:
### Table VII-7

**ESTIMATES OF RESIDENTIAL WATER USE WITH AND WITHOUT CONSERVATION ADJUSTED FOR CURRENT CONDITIONS IN SOUTHEASTERN WISCONSIN**

<table>
<thead>
<tr>
<th>Type of Use</th>
<th>Without Conservation (gpcd)</th>
<th>With Conservation (gpcd)</th>
<th>Adjusted for Southeastern Wisconsin Areas&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Use&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilets</td>
<td>18</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Clothes Washers</td>
<td>15&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Showers</td>
<td>12</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Faucets</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Leaks</td>
<td>7</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Baths</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dishwashers</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>64</td>
<td>44</td>
<td>54</td>
</tr>
<tr>
<td>Outdoor Use&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawn and Garden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watering</td>
<td>35</td>
<td>N/A</td>
<td>8</td>
</tr>
<tr>
<td>Swimming Pools</td>
<td>5</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Car Washing</td>
<td>5</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Driveway Cleaning and Miscellaneous</td>
<td>2</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>47</td>
<td>N/A</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>111</td>
<td>44</td>
<td>65</td>
</tr>
</tbody>
</table>

<sup>a</sup>Ruekert & Mielke, Inc., and SEWRPC.

<sup>b</sup>For columns without and with conservation, AWWA, WaterWiser, 1997 Residential Water Use Summary.


**Source:** Adopted from footnoted sources.

The third column of values represents a SEWRPC staff estimate of the water use adjusted to more closely match the regional per capita residential water use. The adjustment assumes limited water conservation measures are in place and that the annual average outdoor water use is much lower due to seasonal use patterns. It is assumed that all of the indoor water use is returned to the groundwater system via the onsite sewage treatment and disposal system. It is also assumed that a significant portion of the outdoor water use is lost to the groundwater system through runoff, evaporation, and evapotranspiration. If it is assumed that about 75 percent of the outdoor use is lost to the groundwater system, that would equate to about eight gpcd, or about 12 percent of the total water use of 65 gallons per capita per day. Under that scenario, 88 percent of the water use would be returned to the groundwater system. This estimate is reasonably close to the estimate of 90 percent used in Chapter III.

Mr. Grisa referred to page 196 regarding the section on subregional plans. He asked if the referenced 1976 study considered the provision of water to the entirety of the communities involved, or only to subareas of those communities. Mr. Biebel responded that the report alternatives and recommendations related to the entire community areas. Mr. Grisa asked what caused the plan recommendations not to be
implemented. Chairman Bauer indicated that no specific reasons were known, but opined that historically communities in the greater Milwaukee area exhibited an innate inability to undertake in a timely and cooperative manner, major cooperative efforts to implement major development projects. This might be attributed, in part, he said, to the innate conservatism of the public officials and citizens of the area.

Mr. Bunker referred to Maps 33 and 37 and noted that the service areas did not appear to be drawn consistently to illustrate the areas actually served. Mr. Yttri also indicated that he thought there were differences in the way the City of Milwaukee and City of Oak Creek service areas were delineated. Mr. Biebel agreed to check the basis of the mapping for consistency.

[Secretary’s Note: The concern raised was based, in part, upon differences in the color scheme and legends used to identify the areas provided by retail and wholesale services. The maps have been revised to provide consistency in that regard. Another concern was related to the density and generally nearly complete coverage shown in the City of Milwaukee service area, versus a more scattered pattern in the City of Oak Creek, portions of Racine County, and other areas. In this regard, it is noted that the delineation of public water supply service areas—and public sewer service areas—under the regional planning programs was carried out utilizing an explicit set of criteria, including:

1. Natural areas, including woodlands, wetlands, and surface water, which are surrounded by development served by public sewer and/or water, are included within the area served when the natural areas concerned are less than 40 acres in size. Areas 40 acres or larger are not included;

2. Developable lands which are surrounded by development served by public sanitary sewer—or water supply—are included within the area served when the area is less than 20 acres in size. Areas 20 acres or larger are not included;

3. Nonintensive uses, such as recreational parks, golf courses, schools, and cemeteries, are shown as served if such areas are bounded on at least three sides by areas served by public sanitary sewer—or water supply;

4. Major highways and freeways are shown as served if both sides of the facility are served by public sanitary sewer—or water supply. Where appropriate, large intersections, street rights-of-way and freeway lanes along outer fringe area are not included;

5. In general, entire parcels of residential land use are to be shown as served, except in cases along outer fringe areas where only a small percentage of the parcel is actively in use;

6. Subdivisions which are platted and are served by public sewer—or water supply—and which are partially developed, except along outer fringe areas, are included in the area served. Undeveloped subdivisions are not included;

7. Areas of isolated service are shown as served;
8. Special circumstances may apply on the fringe of service areas. In general, three or more residential, commercial, or other buildings falling within 660 feet along a sewer or water line are included within the area served; and

9. Undeveloped areas along existing sewer—or water—lines are not included in the area served, unless the area concerned meets one or more of the other criteria outlined above.

These criteria were used to guide the mapping being reviewed. However, in some cases, judgment was used to refine the procedures to reflect the mapping scale and other considerations. For example, most of the public parks in Milwaukee County have water supply services available and those parks are typically included as served. By applying these criteria and judgments, the mapped City of Milwaukee water service area appears as a nearly fully served delineation. Similarly, but on a smaller scale, so do the Cities of Racine and Kenosha and the inner portion of many other service areas.

Copies of revised Maps 33 and 37 are attached hereto as Exhibit B.

Mr. Duchniak referred to the last paragraph on page 191 and reported that the Waukesha conservation plan was adopted in February 2006. This change was duly noted.

Ms. Conley referred to page 4 of Table E-1 in Appendix E and noted that the water usage for the three private residential wells for the system number MK10 seemed to be high. It was agreed to check the well capacity data source.

[Secretary’s Note: A review of the Wisconsin Department of Natural Resources data base indicates that the well pumpage data provided in the table are as reported, with the three wells in question being for the residence, a landscape area, a pond, and for a cooling use. The amounts reported for the pond and cooling uses likely represent the amounts pumped on intermittent days when in use and are not average annual uses. The column headings have been revised to reflect that the normal and maximum pumpage as reported may be intermittent in nature.]

There being no further questions or comments, on a motion by Mr. Moroney, seconded by Mr. Duchniak, and carried unanimously, Chapter III, “Water Supply Conditions in the Region,” excepting for the summary section, of SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, was approved as amended.

**REVIEW OF SEWRPC PRELIMINARY MAP OF EXISTING MUNICIPAL WATER SUPPLY FACILITIES TO BE USED IN SUMMARY OF CHAPTER III OF SEWRPC PLANNING REPORT NO. 52**

Chairman Bauer asked the Committee to consider Agenda Item 4. He noted that a preliminary draft map proposed to be used in the summary of Chapter III was being distributed. He reminded the Committee that it had been agreed that the Committee would review and approve the format of the map prior to it being distributed publicly and being incorporated into the report. He then asked Mr. Biebel to present the map. Mr. Biebel indicated that the map had deliberately been kept schematic in nature, with no arterial
streets and highways or surface water features being shown. He noted that the symbols as sized covered an area of about 1.0 square mile each.

Chairman Bauer asked the Committee to consider whether or not the map, as presented, satisfied previously expressed Committee concerns regarding system security.

Mr. Grisa asked what purpose the map was intended to serve. Mr. Biebel responded that the maps were intended to illustrate, in summary form, the results of the water supply facilities inventory and would be supportive of summary text. He indicated further that similar maps would be used to illustrate alternative plans. Those maps would include potential new facilities which comprised the alternatives. Chairman Bauer added that typically Regional Planning Commission planning documents included far more detailed system maps to display the existing systems as a basis for performance analyses and preparation of alternative system laws. To be consistent with previous Commission practices, the system maps should show in them correct location and configuration of the major transmission mains, water plants, surface water utilities, wells, and storage facilities, all at useable scale. However, he recognized the commitments made to avoid such detail.

Ms. Lewis indicated that it would be desirable to review the accompanying report text before the Committee agreed to the structure of the maps. After further discussion, it was agreed to that further consideration of facility maps would be deferred until the summary section of Chapter III was reviewed in order to set the maps within the context of the report text.

CONSIDERATION OF CHAPTER VIII, “WATER TRANSMISSION AND STORAGE FACILITIES,” OF SEWRPC TECHNICAL REPORT NO. 43

Chairman Bauer asked the Committee to consider Agenda Item 5. He noted that all Committee members had received a copy of Chapter VIII, “Water Transmission and Storage Facilities,” of SEWRPC Technical Report No. 43 for review prior to the meeting. He then asked Mr. Schultz, the primary author of the chapter, to review the chapter with the Committee on a page-by-page basis. The following questions were raised, comments made, and actions taken in the course of the review.

Ms. Conley referred to the last sentence in the first paragraph on page 2. She indicated the sentence needed clarification.

[Secretary’s Note: The last sentence in the first paragraph on page 2 has been revised and is included in the revised version of Chapter VIII provided with these minutes.]

Ms. Lewis referred to the fourth paragraph on page 2. She noted that minimizing pressure fluctuations is also an important consideration in avoiding system back-siphonage and other contaminated-related incidences. She recommended, and it was generally agreed, to add the words “and the protection of public health” at the end of the paragraph.

Mr. Yttri referred to the fourth paragraph on page 3. He recommended, and it was generally agreed, to delete the second sentence in that paragraph, as it appeared unnecessary in the context of the subsequent text. The change was duly made.

Mr. Grisa referred to the third paragraph on page 4 and asked if the communities agreed with the valving recommendations for system street intersection locations requiring pipe crosses and tees. He noted that the City of Brookfield used the American Water Works Association (AWWA) standard of three and two valves for crosses and tees. Mr. Rau and Ms. Lewis agreed, indicating support for using the AWWA
standard. Mr. Marchese also supported using recognized standard practices. Chairman Bauer indicated that the report should recommend the best—and not necessarily cheapest—practices which may, in some cases, exceed AWWA standards. After some discussion, it was agreed to revise the text.

[Secretary’s Note: The third paragraph on page 4 has been revised and is included in the revised version of Chapter VIII provided with these minutes.]

Mr. Helmuth indicated that Wisconsin Department of Natural Resources staff had reviewed the chapter and offered comment. He referred to the sixth sentence in the third paragraph on page 4. He indicated that reducing the size of transmission mains at valves to minimize cost was not recommended. After further discussion, it was agreed to delete the noted sentence.

Mr. Helmuth referred to the reference to accessible vaults in the second to last sentence of the third paragraph on page 4. He recommended, and it was generally agreed to add text regarding the need for confined space training when entering such vaults.

[Secretary’s Note: The fourth paragraph on page 4 has been expanded to add a reference to confined space training. The added text is included in the revised version of Chapter VIII transmitted with these minutes.]

Mr. Helmuth referred to the common control valves noted in the last sentence of the fourth paragraph on page 4. He asked if cone valves were commonly used. Mr. Schultz and Mr. Bunker indicated that such valves were used and had particular value for flow control.

Mr. Helmuth referred to the last paragraph on page 4. He recommended that text be added regarding the desirability of minimizing the use of pressure regulating valves due to their maintenance requirements.

[Secretary’s Note: Text has been added to the last paragraph on page 4 regarding the desirability of limiting pressure reducing valves. The added text is included in the revised version of Chapter VIII transmitted with these minutes.]

Ms. Lewis referred to the third paragraph on page 5 and the first full paragraph on page 6 regarding the issue of water quality and the need for water main looping. She noted that there were conflicting objectives in water main design and operation which need to be addressed, in that the design of systems for fire flow requirements typically governs water main sizing. That sizing is typically much larger than typically needed for customer demands. The larger sizing for fire flow can result in longer than desirable residence times and concomitant water quality problems. If water system flushing is one of the methods used for resolution of such problems, water usage is increased. Ms. Lewis also noted that water main looping was not always the best way to resolve the issues noted. She indicated that, in some cases, flushing or using a smaller dual force main for typical domestic use at selected locations are other viable options. It was agreed to add text addressing the issues raised by Ms. Lewis.

[Secretary’s Note: Text has been added to the second full paragraph on page 6 (now pages 5 and 6) regarding the issues raised by Ms. Lewis. The added text is included in the revised version of Chapter VIII transmitted with these minutes.]

Ms. Lewis referred to the third paragraph on page 5 and noted that there were other water quality concerns, in addition to bacteriological changes, associated with long water residence times, including disinfection byproducts. It was agreed to expand the text accordingly.
Mr. Bunker referred to the first full paragraph on page 6 and indicated the looping of water mains improved firefighting capabilities. It was generally agreed to add that concept to the paragraph.

Mr. Helmuth referred to the first sentence in the third full paragraph on page 6. He recommended, and it was generally agreed, to replace the word “covers” with the words “regulates the design of” in that sentence. The change was duly noted.

Mr. Marchese referred to Tables VIII-6, VIII-7, and VIII-8 which included cost information. He recommended, and it was generally agreed, to clarify the tables, indicating that the costs were estimated construction costs and that for planning purposes, an allowance would be added to develop project costs, including engineering, contingencies, legal, and administrative costs. He emphasized the importance of having uniform costing procedures for the alternative plans as they are developed. It was agreed to clarify the cost tables through added text or footnotes.

Mr. Grisa referred to the water main depth item in Table VIII-5 and recommended that the concept of insulating water mains be added. The recommendation was generally agreed to and was duly noted.

Ms. Lewis cited the importance of topography in decision-making and the viability of ground-level or underground structures, noting that these types of structures can provide effective gravity storage if located at suitably high elevations. It was agreed to include text on this design consideration.

Mr. Rau reported that the number of storage tanks can often be reduced if consideration is given to larger service areas and/or regional evaluations. He also noted that some smaller communities do not allow elevated storage due to aesthetic or other conditions. He indicated that in such cases, standby power would likely be required. It was agreed to add reference to the concept of minimizing storage requirements when larger or regional system evaluations are considered.
There being no further questions or comments, on a motion by Mr. Melcher seconded by Mr. Rau, and carried unanimously, Chapter VIII, “Water Transmission and Storage Facilities,” of SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*, was approved as amended.

**DATE AND TIME OF NEXT MEETING**

After a brief discussion, the next meeting of the Advisory Committee was tentatively scheduled to be held in the Commission offices on November 28, 2006, beginning at 9:00 a.m.

[Secretary’s Note: The meeting date has been revised to December 5, 2006.]

Chairman Bauer noted that, at that meeting, it was planned to review the summary section of Chapter III, “Existing Water Supply Conditions,” of SEWRPC Planning Report No. 52 and to review Chapter VII, “Water Conservation,” of SEWRPC Technical Report No. 43. He noted further that there would then remain only two chapters of the state-of-the-art report to be reviewed, one of which consisted of the existing facilities summary which would be similar to summary section of Chapter III of SEWRPC Planning Report No. 52. The other, was a summary and conclusions chapter which would present information on application of standards and cost data. He opined that it should be possible to complete the state-of-the-art report near the end of the year. That would leave the Committee with the task of reviewing the water supply law report, and the remaining chapters of the planning report in 2007. A draft of the water law report should be ready for review in January 2007.

**ADJOURNMENT**

There being no further business to come before the Committee, on a motion by Mr. Marchese, seconded by Mr. Melcher, and carried unanimously, the meeting was adjourned at 11:50 a.m.

*   *   *

#121824 V1 - RWSP MINUTES 10/11/06
KW/B/RPB/pk
11/15/06
(This Page Left Blank Intentionally)
## Table 32

### SELECTED CHARACTERISTICS OF EXISTING MUNICIPAL WATER SUPPLY SYSTEMS WITHIN KENOSHA COUNTY: 2005

<table>
<thead>
<tr>
<th>Water Supply System</th>
<th>Class</th>
<th>Estimated Area Served (square miles)</th>
<th>Estimated Population Served</th>
<th>Source of Supply</th>
<th>Number of Wells</th>
<th>Total Well Pumpage Capacity (mgd)</th>
<th>Number of Lake Water Intakes</th>
<th>Treatment Processes</th>
<th>Surface Treatment Plant Capacity (mgd)</th>
<th>Number of Storage Facilities</th>
<th>Total Storage Capacity (gallons x 1,000)</th>
<th>2005 Annual Average Pumping (mgd)</th>
<th>2005 Maximum Daily Pumping (mgd)</th>
<th>10-Year Maximum Daily Pumping (mgd)</th>
<th>Spent Water Receiving System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town of Bristol Utility District No. 1</td>
<td>D</td>
<td>0.7</td>
<td>1,400</td>
<td>G</td>
<td>2</td>
<td>1.30</td>
<td></td>
<td>H, F</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>0.24</td>
<td>0.40</td>
<td>0.75</td>
<td>Bristol Creek</td>
</tr>
<tr>
<td>Town of Bristol Utility District No. 3</td>
<td>D</td>
<td>0.1</td>
<td>-</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>-</td>
<td>27.41</td>
<td>27.41</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Kenosha Water Utility</td>
<td>AB</td>
<td>23.1</td>
<td>103,100</td>
<td>G</td>
<td>-</td>
<td>-</td>
<td></td>
<td>CH, C, S, F, MC, FL, CC</td>
<td>42</td>
<td>9</td>
<td>19,200</td>
<td>15.28</td>
<td>27.41</td>
<td>27.41</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Paddock Lake Municipal Water Utility</td>
<td>D</td>
<td>0.2</td>
<td>1,000</td>
<td>G</td>
<td>2</td>
<td>0.79</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.07</td>
<td>0.18</td>
<td>0.58</td>
<td>Brighton Creek</td>
</tr>
<tr>
<td>Pleasant Prairie Water Utility</td>
<td>AB</td>
<td>8.7</td>
<td>9,200</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>12,200</td>
<td>1.91</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Town of Somers Water Utility</td>
<td>C</td>
<td>1.4</td>
<td>2,100</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.08</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>34.2</td>
<td>116,900</td>
<td>-</td>
<td>4</td>
<td>2.09</td>
<td></td>
<td>-</td>
<td>-</td>
<td>42</td>
<td>17</td>
<td>31,760</td>
<td>17.60</td>
<td>27.99</td>
<td>28.74</td>
</tr>
</tbody>
</table>
### Table 34

**SELECTED CHARACTERISTICS OF EXISTING MUNICIPAL WATER SUPPLY SYSTEMS WITHIN MILWAUKEE COUNTY: 2005**

| Water Supply System                                      | Class | Estimated Area Served (square miles) | Estimated Population Served | Source of Supply | Number of Wells | Total Well Pumpage Capacity (mgd) | Well Aquifer | Number of Lake Water Intakes | Treatment Processes | Surface Treatment Plant Capacity (mgd) | Number of Storage Facilities | Total Storage Capacity (gallons x 1,000) | 2005 Annual Average Pumping (mgd) | 2005 Maximum Daily Pumping (mgd) | 10-Year Maximum Daily Pumping (mgd) | Spent Water Receiving System |
|----------------------------------------------------------|-------|-------------------------------------|-----------------------------|------------------|----------------|-----------------------------------|-------------|----------------------------|----------------------|---------------------------------------|-------------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------|
| City of Cudahy Water Utility                             | AB    | 4.8                                 | 18,300                      | S                | -              | 2 CH, S, F, FL, H, D, CC          | -           | 6                          | 2                    | 2,500                                 | 6                             | 4.21                              | 6.47                             | 8.24                             | Lake Michigan |
| City of Franklin Water Utility                           | C     | 8.3                                 | 24,400                      | SP               | -              | -                                 | -           | 7                          | 2                    | 3,268                                 | -                             | -                                 | -                                 | -                                 | Lake Michigan |
| City of Glendale Water Utility                           | AB    | 6.0                                 | 13,000                      | S                | -              | -                                 | CH, C, D, F | 18                         | -                    | 4,856                                 | 4                             | 1.80                              | 4.29                             | -                                 | Lake Michigan |
| City of Milwaukee Water Works                           | AB    | 120.9                               | 647,200                     | S                | -              | 2 CH, C, D, S, F, FL, O, CC        | 275 Limwood, 105 Howard Avenue | 8              | 117,000                      | 122.08                            | 186.15                             | 218.00                            | -                                 | Lake Michigan |
| City of Oak Creek Water and Sewer Utility                | AB    | 12.5                                | 29,000                      | S                | -              | 2 CH, C, D, S, F, FL               | 20          | 4                          | 7,088                             | 8.26                                 | 8.26                             | -                                 | -                                 | Lake Michigan |
| City of South Milwaukee Water Utility                    | AB    | 4.3                                 | 21,400                      | S                | -              | 1 CH, C, D, S, F, MC, F, FL, CC    | 8           | 3                          | 3,500                             | 2.51                                 | 4.19                             | -                                 | -                                 | Lake Michigan |
| City of Wauwatosa Water Utility                          | AB    | 12.9                                | 46,300                      | SP               | -              | -                                 | -           | 6                          | 10,200                            | 5.99                                 | -                                 | -                                 | -                                 | Lake Michigan |
| City of West Allis Water Utility                         | AB    | 10.6                                | 60,900                      | SP               | -              | -                                 | -           | 3                          | 7,000                             | 6.86                                 | -                                 | -                                 | -                                 | Lake Michigan |
| Village of Bayside, We Energies                         | -     | 0.3                                 | 900                         | SP               | -              | -                                 | -           | 0.06                       | -                                 | -                                 | -                                 | -                                 | -                                 | -                                 | Lake Michigan |
| Village of Brown Deer Public Water Utility               | AB    | 4.4                                 | 11,800                      | SP               | -              | -                                 | -           | 0                          | 2,000                             | 1.45                                 | -                                 | -                                 | -                                 | Lake Michigan |
| Village of Fox Point Water Utility                       | C     | 2.9                                 | 6,900                       | S                | -              | -                                 | CH, C, D, S | 1                          | 1,500                             | 0.71                                 | 2.01                             | -                                 | -                                 | Lake Michigan |
| Village of Greendale Water Utility                       | AB    | 4.3                                 | 14,100                      | SP               | -              | -                                 | -           | 3                          | 2,190                             | 1.53                                 | -                                 | -                                 | -                                 | Lake Michigan |
| Village of Shorewood Municipal Water Utility             | C     | 1.6                                 | 13,500                      | SP               | -              | -                                 | -           | 0                          | -                                 | 1.33                                 | -                                 | -                                 | -                                 | Lake Michigan |
| Village of Whitefish Bay Water Utility                   | AB    | 2.1                                 | 13,900                      | S                | -              | 1 CH, C, D, S, F                   | 3           | 5,990                      | 1.47                               | 3.01                                 | -                                 | -                                 | -                                 | Lake Michigan |
| **Total**                                                | -     | **195.9**                           | **920,800**                |                  |                |                                    |              | **432**                     | **45**                             | **167,092**                          | **160.80**                        | **248.40**                        | **252.73**                       | -                                 |

---

*The municipal water and combined water and sewer utilities are based upon the number of customers as follows: Class AB = 4,000 or more customers; Class C = from 1,000 to less than 4,000 customers; and Class D = less than 1,000 customers.

bPopulation based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRP data, where appropriate.

cThe following abbreviations are used:

- **G** = Groundwater
- **S** = Surface Water (Lake Michigan)
- **SP** = Surface Water Purchased (Lake Michigan)

dThe following abbreviations are used:

- **SG** = Sand and Gravel
- **SD** = Silurian Dolomite
- **GP** = Galena-Platteville Dolomite
- **S** = Sandstone
- **M** = Multiple Aquifers
Table 34 (continued)

6Make up code for treatment types, such as:

- CH = Pre-Sedimentation Chemical Addition
- S = Sedimentation
- C = Coagulation
- F = Filtration
- MC = Micro-Filtration
- FL = Fluoridation
- D = Disinfection
- CC = Corrosion Control
- I = Ion Exchange
- P = Phosphate Addition (sequestering)
- SH = Sodium Hypochlorite Chemical Addition
- H = Hypochlorination
- O = Ozone Filtration

The Northshore Water Commission owns and operates a water treatment plant which provides water to the City of Glendale Water Utility, the Village of Fox Point Water Utility, and the Village of Whitefish Bay Water Utility.

The City of Milwaukee Water Works provides retail water service to the Cities of Greenfield, Milwaukee, and St. Francis; the Villages of Hales Corners and Binnen Deer, and the far northeast portion of the City of Franklin. The City of Milwaukee Water Works provides wholesale water service to the Cities of Wauwatosa and West Allis and the Villages of Greendale and Shorewood. The Village of West Milwaukee receives billing services from the City of Milwaukee Water Works but maintains its own distribution system.

Population served is that within the retail service area of the City of Milwaukee Water Works and the Village of West Milwaukee.

Excludes water sold to communities outside of Milwaukee County.

Includes total water pumped, including that sold to communities outside of Milwaukee County.

Source: Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, water utilities, and SEWRPC.
### Table 36
SELECTED CHARACTERISTICS OF EXISTING MUNICIPAL WATER SUPPLY SYSTEMS WITHIN OZAUKEE COUNTY: 2005

| Water Supply System                        | Class | Estimated Area Served (square miles) | Estimated Population Served | Source of Supply | Number of Wells | Number of Lake Water Intakes | Treatment Process | Surface Treatment Plant Capacity (mgd) | Number of Storage Facilities | 2005 Storage Capacity (gallons x 1,000) | 2005 Annual Average Pumping (mgd) | 2005 Maximum Daily Pumping (mgd) | 10-Year Maximum Daily Pumping (mgd) | Spent Water Receiving System |
|--------------------------------------------|-------|-------------------------------------|-----------------------------|-----------------|----------------|---------------------------|------------------|----------------------------------------|-------------------------------|------------------------------------|----------------------------------|---------------------------------|----------------------------------|--------------------------------|---------------------------------|
| City of Cedarburg Light & Water Commission | AB    | 3.3                                 | 11,400                      | G               | 5              | 5.10 SD                   | H, CC, F         | 3                                      | 1,250                         | 1.42                               | 2.54                             | 2.59                              | Cedar Creek                      |
| City of Mequon Water Utility (WE Energies Water Services) | D     | 5.1                                 | 7,500                       | SP              | -              | -                         | -               | -                                      | -                             | -                                 | -                               | -                                | Lake Michigan                    |
| City of Port Washington Water Utility      | AB    | 3.0                                 | 10,800                      | S               | -              | -                         | S, C, CC, F, D, H | 4                                      | 3                             | 1,850                             | 1.20                             | 2.96                             | 2.96                             | Lake Michigan                    |
| Village of Belgium Water Utility           | C     | 0.6                                 | 1,900                       | G               | 3              | 2.46 SD                   | H, P            | 4                                      | 535                           | 0.29                               | 0.65                             | 7.41                             | E. Branch Belgium Creek          |
| Village of Fredonia Municipal Water Utility | D    | 0.7                                 | 2,100                       | G               | 2              | 1.29 SD                   | H, CL           | 3                                      | 380                          | 0.19                               | 1.07                             | 0.67                             | Milwaukee River                  |
| Village of Grafton Water and Wastewater Commission | C     | 3.4                                 | 11,300                      | G               | 6              | 4.85 S, SD, SH            | CC, H, F        | 5                                      | 846                           | 1.38                               | 2.72                             | 2.72                             | Milwaukee River                  |
| Village of Saukville Municipal Water Utility | C    | 1.6                                 | 4,200                       | G               | 4              | 3.93 SD                   | D, P, F         | 5                                      | 1,450                         | 1.31                               | 1.91                             | 1.50                             | Milwaukee River                  |
| Total                                      | -     | -                                   | -                           | -               | 20             | 17.63 -                   | 2              | 4                                      | 23                            | 6,311                             | 6.74                             | 11.85                            | -                                | -                               |

**NOTE:** N/A indicates data not available.

*The municipal water and combined water and sewer utilities are based upon the number of customers as follows: Class AB 4,000 or more customers; Class C from 1,000 to less than 4,000 customers; and Class D less than 1,000 customers.

The population based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRPC data, where appropriate.

The following abbreviations are used:

- **G** = Groundwater
- **S** = Surface Water (Lake Michigan)
- **SP** = Surface Water Purchased (Lake Michigan)

The following abbreviations are used:

- **SG** = Sand and Gravel
- **SD** = Silurian Dolomite
- **GP** = Galena-Platteville Dolomite
- **M** = Multiple Aquifers

Make up code for treatment types, such as:

- **CH** = Pre-Sedimentation Chemical Addition
- **S** = Sedimentation
- **C** = Coagulation
- **F** = Filtration
- **MC** = Micro-Filtration
- **FL** = Fluoridation

- **D** = Disinfection
- **CC** = Corrosion Control
- **I** = Ion Exchange
- **P** = Phosphate Addition (sequestering)
- **SH** = Sodium Hypochlorite Chemical Addition
- **H** = Hypochlorination

*Included in City of Milwaukee pumpage data.

Source: Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, water utilities, and SEWRPC.
## Table 38
SELECTED CHARACTERISTICS OF EXISTING MUNICIPAL WATER SUPPLY SYSTEMS WITHIN RACINE COUNTY: 2005

<table>
<thead>
<tr>
<th>Water Supply System</th>
<th>Class</th>
<th>Estimated Area Served (square miles)</th>
<th>Estimated Population Served</th>
<th>Source of Supply</th>
<th>Number of Wells</th>
<th>Total Well Pumpage Capacity (mgd)</th>
<th>Well Aquifer&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Treatment Processes&lt;sup&gt;g&lt;/sup&gt;</th>
<th>Surface Treatment Plant Capacity (mgd)</th>
<th>Number of Storage Facilities</th>
<th>Total Storage Capacity (gallons x 1,000)</th>
<th>2005 Annual Average Pumping (mgd)</th>
<th>2005 Maximum Daily Pumping (mgd)</th>
<th>10-Year Maximum Daily Pumping (mgd)</th>
<th>Spent Water Receiving System</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Burlington Water Utility</td>
<td>AB</td>
<td>3.5</td>
<td>10,300</td>
<td>G</td>
<td>4</td>
<td>6.16</td>
<td>S</td>
<td>D, H</td>
<td>5</td>
<td>3,400</td>
<td>2.24</td>
<td>3.76</td>
<td>3.76</td>
<td>Fox River</td>
<td></td>
</tr>
<tr>
<td>City of Racine Water and Wastewater Utility and including Village of Mt. Pleasant Water Users</td>
<td>AB</td>
<td>21.9</td>
<td>102,100</td>
<td>S</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12,846</td>
<td>22.78</td>
<td>37.31</td>
<td>Lake Michigan</td>
<td></td>
</tr>
<tr>
<td>Village of Sturtevant/Water and Sewer Utility</td>
<td>AB</td>
<td>1.6</td>
<td>5,900</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
<td>0.79</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Village of Union Grove Water Utility</td>
<td>C</td>
<td>1.5</td>
<td>4,500</td>
<td>G</td>
<td>3</td>
<td>3.63</td>
<td>SD, S</td>
<td>D, H, Z</td>
<td>2</td>
<td>618</td>
<td>0.53</td>
<td>0.88</td>
<td>1.56</td>
<td>W. Branch Root River Canal</td>
<td></td>
</tr>
<tr>
<td>Village of Waterford Water and Sewer Utility</td>
<td>D</td>
<td>1.4</td>
<td>4,500</td>
<td>G</td>
<td>3</td>
<td>2.79</td>
<td>SD, SG, S</td>
<td>None</td>
<td>2</td>
<td>600</td>
<td>0.51</td>
<td>1.04</td>
<td>1.10</td>
<td>Fox River</td>
<td></td>
</tr>
<tr>
<td>Village of Wind Point Municipal Water Utility</td>
<td>D</td>
<td>1.2</td>
<td>1,800</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Caddy Vista Sanitary District</td>
<td>D</td>
<td>0.2</td>
<td>800</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.04</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Village of Caledonia Water Utility District No. 1</td>
<td>C</td>
<td>2.0</td>
<td>3,400</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>750</td>
<td>0.60</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>Crestview Sanitary District</td>
<td>D</td>
<td>1.3</td>
<td>3,900</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>0.47</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>North Park Sanitary District No. 1</td>
<td>C</td>
<td>3.4</td>
<td>9,200</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>750</td>
<td>0.32</td>
<td>-</td>
<td>-</td>
<td>Lake Michigan</td>
</tr>
<tr>
<td>North Cape Sanitary District</td>
<td>D</td>
<td>0.1</td>
<td>100</td>
<td>SP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>490</td>
<td>0.01</td>
<td>-</td>
<td>-</td>
<td>Groundwater via septic tanks</td>
</tr>
<tr>
<td>Town of Yorkville Water Utility District No. 1</td>
<td>D</td>
<td>0.2</td>
<td>&lt;50</td>
<td>G</td>
<td>1</td>
<td>1.60</td>
<td>SD, D, H, CC</td>
<td>-</td>
<td>1</td>
<td>750</td>
<td>0.23</td>
<td>1.24</td>
<td>1.10</td>
<td>Hood's Creek</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>38.3</td>
<td>146,500</td>
<td>-</td>
<td>12</td>
<td>14.18</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>23</td>
<td>20,554</td>
<td>29.68</td>
<td>48.51</td>
<td>7.52</td>
</tr>
</tbody>
</table>

**NOTE:** N/A indicates data not available.

<sup>a</sup>The municipal water and combined water and sewer utilities are based on the number of customers as follows: Class AB 4,000 or more customers; Class C from 1,000 to less than 4,000 customers; and Class D less than 1,000 customers.

<sup>b</sup>Population based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRPC data, where appropriate.

<sup>c</sup>The following abbreviations are used:
- G = Groundwater
- S = Surface Water (Lake Michigan)
- SP = Surface Water PURCHASED (Lake Michigan)

<sup>d</sup>The following abbreviations are used:
- SG = Sand and Gravel
- SD = Silurian Dolomite
- GP = Galena-Platteville Dolomite
- S = Sandstone
- M = Multiple Aquifers
- SH = Shale

<sup>e</sup>Make up code for treatment types, such as:
- CH = Pre-Sedimentation Chemical Addition
- S = Sedimentation
- C = Coagulation
- F = Filtration
- M = Micro-Filtration
- FL = Fluoridation
- Z = Zeolite Softening
- SA = Spray Aeration
- TA = Slat Tray Aeration

<sup>f</sup>Include in pumpage values for Racine Water Utility.

<sup>g</sup>Include in pumpage values for North Park Sanitary District.

<sup>h</sup>Include in pumpage values for Oak Creek Water and Sewer Utility.

<sup>i</sup>Include in pumpage values for Crestview Sanitary District.

Source: Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, water utilities, and SEWRPC.
<table>
<thead>
<tr>
<th>Water Supply System</th>
<th>Class</th>
<th>Estimated Area Served (square miles)</th>
<th>Estimated Population Served</th>
<th>Source of Supply</th>
<th>Number of Wells</th>
<th>Well Aquifer</th>
<th>Number of Lake Water Intakes</th>
<th>Treatment Processes</th>
<th>Surface Treatment Plant Capacity (mgd)</th>
<th>Number of Storage Facilities</th>
<th>Total Storage Capacity (gallons x 1,000)</th>
<th>Total 2005 Annual Average Pumping (mgd)</th>
<th>Total 2005 Maximum Daily Pumping (mgd)</th>
<th>10-Year Maximum Daily Pumping (mgd)</th>
<th>Total 2005 Spent Water Receiving System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delavan Water and Sewerage Commission</td>
<td>AB</td>
<td>2.80</td>
<td>8,200</td>
<td>G</td>
<td>4</td>
<td>4.20</td>
<td>S, G, F, FL, P, PA</td>
<td>-</td>
<td>2,300</td>
<td>11.30</td>
<td>2.55</td>
<td>2.47</td>
<td></td>
<td></td>
<td>Turtle Creek</td>
</tr>
<tr>
<td>Elkhorn Light and Water</td>
<td>AB</td>
<td>2.60</td>
<td>8,600</td>
<td>G</td>
<td>4</td>
<td>-</td>
<td>S, F, H, S, I, P, PA</td>
<td>-</td>
<td>3</td>
<td>1,020</td>
<td>1.120</td>
<td>1.93</td>
<td></td>
<td></td>
<td>Turtle Creek</td>
</tr>
<tr>
<td>Lake Geneva Municipal Water Utility</td>
<td>AB</td>
<td>2.80</td>
<td>8,000</td>
<td>G</td>
<td>4</td>
<td>7.29</td>
<td>S, G, F, H, P, FL, PA</td>
<td>-</td>
<td>5</td>
<td>2,260</td>
<td>1.450</td>
<td>2.86</td>
<td>3.00</td>
<td></td>
<td>Groundwater system</td>
</tr>
<tr>
<td>Whitewater Municipal Water Utility</td>
<td>AB</td>
<td>3.20</td>
<td>11,200</td>
<td>G</td>
<td>5</td>
<td>7.63</td>
<td>S, G, F, FL</td>
<td>-</td>
<td>4</td>
<td>2,400</td>
<td>1.990</td>
<td>3.79</td>
<td>3.79</td>
<td></td>
<td>Whitewater Creek</td>
</tr>
<tr>
<td>Darien Water Works and Sewer System</td>
<td>C</td>
<td>0.70</td>
<td>1,600</td>
<td>G</td>
<td>2</td>
<td>1.00</td>
<td>S, G, F, SQ, TA</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>0.120</td>
<td>0.38</td>
<td></td>
<td></td>
<td>Turtle Creek</td>
</tr>
<tr>
<td>Village of East Troy Municipal Water Utility</td>
<td>C</td>
<td>1.50</td>
<td>3,900</td>
<td>G</td>
<td>3</td>
<td>1.87</td>
<td>S, G, GP</td>
<td>-</td>
<td>2</td>
<td>850</td>
<td>0.650</td>
<td>1.04</td>
<td>1.26</td>
<td></td>
<td>Honey Creek</td>
</tr>
<tr>
<td>Fontana Municipal Water Utility</td>
<td>C</td>
<td>2.00</td>
<td>1,800</td>
<td>G</td>
<td>4</td>
<td>3.04</td>
<td>S, G, SD</td>
<td>-</td>
<td>3</td>
<td>2,120</td>
<td>0.400</td>
<td>1.10</td>
<td>1.13</td>
<td></td>
<td>Piscasaw Creek</td>
</tr>
<tr>
<td>Village of Geneva City Municipal Water Utility</td>
<td>C</td>
<td>0.80</td>
<td>2,400</td>
<td>G</td>
<td>3</td>
<td>-</td>
<td>S, G, S, I</td>
<td>-</td>
<td>3</td>
<td>660</td>
<td>0.220</td>
<td>0.53</td>
<td></td>
<td></td>
<td>Nippersink Creek</td>
</tr>
<tr>
<td>Sharon Waterworks and Sewer System</td>
<td>C</td>
<td>0.70</td>
<td>1,500</td>
<td>G</td>
<td>2</td>
<td>1.44</td>
<td>S, G, S, FL</td>
<td>-</td>
<td>1</td>
<td>250</td>
<td>0.120</td>
<td>0.17</td>
<td>0.32</td>
<td></td>
<td>Little Turtle Creek</td>
</tr>
<tr>
<td>Walworth Municipal Water and Sewer Utility</td>
<td>C</td>
<td>1.00</td>
<td>2,600</td>
<td>G</td>
<td>2</td>
<td>1.25</td>
<td>S, G, S, FL</td>
<td>-</td>
<td>1</td>
<td>500</td>
<td>0.490</td>
<td>0.78</td>
<td>9.90</td>
<td></td>
<td>Piscasaw Creek</td>
</tr>
<tr>
<td>Williams Bay Municipal Water Utility</td>
<td>C</td>
<td>1.50</td>
<td>2,600</td>
<td>G</td>
<td>3</td>
<td>4.10</td>
<td>S, G, FL</td>
<td>-</td>
<td>5</td>
<td>550</td>
<td>0.320</td>
<td>0.82</td>
<td></td>
<td></td>
<td>Turtle Creek</td>
</tr>
<tr>
<td>Pell Lake Sanitary District No. 1</td>
<td>AB</td>
<td>1.30</td>
<td>3,900</td>
<td>G</td>
<td>2</td>
<td>1.15</td>
<td>S, I, G, F, FL, Z</td>
<td>-</td>
<td>1</td>
<td>300</td>
<td>0.230</td>
<td>0.40</td>
<td>0.40</td>
<td></td>
<td>N. Branch Nippersink Creek</td>
</tr>
<tr>
<td>Town of East Troy Sanitary District No. 3</td>
<td>D</td>
<td>0.04</td>
<td>40</td>
<td>G</td>
<td>1</td>
<td>0.60</td>
<td>S, G, F, P, FL, Z</td>
<td>-</td>
<td>3</td>
<td>0.94</td>
<td>0.094</td>
<td>0.51</td>
<td>0.02</td>
<td></td>
<td>Groundwater system</td>
</tr>
<tr>
<td>Lake Como Sanitary District No. 1</td>
<td>D</td>
<td>1.10</td>
<td>2,200</td>
<td>G</td>
<td>2</td>
<td>1.48</td>
<td>S, G, F, FL, Z</td>
<td>-</td>
<td>1</td>
<td>200</td>
<td>0.140</td>
<td>0.27</td>
<td>0.69</td>
<td></td>
<td>Turtle Creek</td>
</tr>
<tr>
<td>County Estates Sanitary District No. 1</td>
<td>D</td>
<td>0.09</td>
<td>500</td>
<td>G</td>
<td>2</td>
<td>1.15</td>
<td>S, H</td>
<td>-</td>
<td>1</td>
<td>50</td>
<td>0.020</td>
<td>0.51</td>
<td>0.14</td>
<td></td>
<td>White River</td>
</tr>
<tr>
<td>Troy Sanitary District No. 1</td>
<td>D</td>
<td>0.07</td>
<td>100</td>
<td>G</td>
<td>1</td>
<td>1.32</td>
<td>S, S, FL</td>
<td>-</td>
<td>4</td>
<td>38</td>
<td>3,105</td>
<td>8.10</td>
<td>17.14</td>
<td></td>
<td>Groundwater system</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>22.20</td>
<td>59,100</td>
<td>G</td>
<td>44</td>
<td>35.20</td>
<td>-</td>
<td>-</td>
<td>38</td>
<td>13,500</td>
<td>8.410</td>
<td>17.14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** N/A indicates data not available.

*The municipal water and combined water and sewer utilities are based upon the number of customers as follows: Class AB 4,000 or more customers; Class C from 1,000 to less than 4,000 customers; and Class D less than 1,000 customers.

*Population based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRPC data, where appropriate.

*The following abbreviations are used:

- **G** = Groundwater
- **S** = Surface Water (Lake Michigan)
- **SP** = Surface Water Purchased (Lake Michigan)

*The following abbreviations are used:

- **SG** = Sand and Gravel
- **SD** = Silurian Dolomite
- **GP** = Galena-Platteville Dolomite
- **SH** = Shale

*Make up code for treatment types, such as:

- **CH** = Pre-Sedimentation Chemical Addition
- **S** = Sedimentation
- **P** = Polyelectrolyte (Iron or Manganese Removal)
- **C** = Coagulation
- **I** = Ion Exchange
- **F** = Filtration
- **G** = Gaseous Chlorination
- **MC** = Micro-Filtration
- **SH** = Sodium Hypochlorite Chemical Addition
- **FL** = Fluoridation
- **Z** = Zeolite Softening
- **PA** = Packed Tower Aeration
- **PH** = pH Adjustment
- **LS** = Lime Soda Ash Addition
- **TA** = Slat Tray Aeration
- **FC** = Flocculation

*Source: Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, water utilities, and SEWRPC.*
### Table 42
**SELECTED CHARACTERISTICS OF EXISTING MUNICIPAL WATER SUPPLY SYSTEMS WITHIN WASHINGTON COUNTY: 2005**

| Water Supply System | Classa | Estimated Area Served (square miles) | Estimated Population Servedb | Source of Supplyc | Number of Wells | Total Well Pumpage Capacity (mgd) | Well Aquiferd | Number of Lake Water Intakes | Treatment Processese | Surface Treatment Plant Capacity (mgd) | Number of Storage Facilities | Total Storage Capacity (gallons x 1,000) | 2005 Annual Average Pumping (mgd) | 2005 Maximum Daily Pumping (mgd) | 10-Year Maximum Daily Pumping (mgd) | Spent Water Receiving System |
|---------------------|--------|-------------------------------------|-----------------------------|-------------------|----------------|-------------------------------|----------------|----------------------------|-----------------------------|----------------------------|-----------------------------|---------------------------------|---------------------------------|---------------------------------|-------------------------------|---------------------------------|-----------------------------|
| City of Hartford Water Utilities | AB     | 3.4                                 | 12,800                      | G                 | 6              | -                            | SG, S         | -                          | G, FL, SG                  | -                          | 5                           | 220                             | 1.60                           | 2.99                           | -                             | Rubicon River                   |
| City of West Bend Water Utility | AB     | 8.4                                 | 30,000                      | G                 | 9              | 1.08                        | SAG'S         | -                          | H, P, FL, PA               | -                          | 8                           | 4,615                           | 3.02                           | 4.83                           | 5.69                          | Milwaukee River                |
| Village of Germantown Water Utility | AB     | 5.7                                 | 16,000                      | G                 | 4              | 5.32                        | S, SD         | -                          | H, FL                      | -                          | 3                           | 2,000                           | 2.18                           | 3.99                           | 3.92                          | Lake Michigan                   |
| Village of Jackson Water Utility | C      | 1.6                                 | 5,900                       | G                 | -              | 2.68                        | -             | -                          | G                          | -                          | 2                           | 700                             | 0.61                           | 1.13                           | -                             | Cedar Creek                     |
| Village of Kewaskum Municipal Water Utility | C | 1.0                                 | 3,800                       | G                 | 4              | 2.26                        | -             | FL                         | -                          | 6                           | 925                          | 0.34                           | 0.65                           | 1.20                          | Milwaukee River                |
| Slinger Utilities | C      | 1.4                                 | 4,100                       | G                 | 3              | -                            | SG, SD        | -                          | H, P, TA                   | -                          | 1                           | 250                             | 0.37                           | 0.43                           | -                             | Rubicon River                   |
| Allenton Sanitary District | D      | 0.3                                 | 800                         | G                 | 2              | 1.12                        | S             | SH, P                      | -                          | 1                           | 350                          | 0.08                           | 0.12                           | 0.25                          | E. Branch Rock River            |
| **Total**          |        | **21.8**                            | **73,400**                  | **-**             | **-**           | **9.76**                   | **-**         | **-**                      | **-**                       | **26**                      | **10,940**                   | **8.20**                       | **14.14**                      | -                             | -                              |

**NOTE:** N/A indicates data not available.

aThe municipal water and combined water and sewer utilities are based upon the number of customers as follows: Class AB 4,000 or more customers; Class C from 1,000 to less than 4,000 customers; and Class D less than 1,000 customers.

bPopulation based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRPC data, where appropriate.

cThe following abbreviations are used:

- **G** = Groundwater
- **S** = Surface Water (Lake Michigan)
- **SP** = Surface Water Purchased (Lake Michigan)

dThe following abbreviations are used:

- **SG** = Sand and Gravel
- **SD** = Silurian Dolomite
- **GP** = Galena-Platteville Dolomite

fThe following abbreviations are used:

- **CH** = Pre-Sedimentation Chemical Addition
- **S** = Sedimentation
- **C** = Coagulation
- **F** = Filtration
- **MC** = Micro-Filtration
- **FL** = Fluoridation
- **Z** = Zeoatte Softening
- **SA** = Spray Aeration

- **P** = Polyphosphate Inhibitor (Corrosion Control)
- **I** = Ion Exchange
- **G** = Gaseous Chlorination
- **SH** = Sodium Hypochlorite Chemical Addition
- **H** = Hypochlorination
- **PA** = Packed Tower Aeration
- **TA** = Slat Tray Aeration

- **CH** = Pre-Sedimentation Chemical Addition
- **S** = Sedimentation
- **C** = Coagulation
- **F** = Filtration
- **MC** = Micro-Filtration
- **FL** = Fluoridation
- **Z** = Zeolite Softening
- **SA** = Spray Aeration

- **P** = Polyphosphate Inhibitor (Corrosion Control)
- **I** = Ion Exchange
- **G** = Gaseous Chlorination
- **SH** = Sodium Hypochlorite Chemical Addition
- **H** = Hypochlorination
- **PA** = Packed Tower Aeration
- **TA** = Slat Tray Aeration

**Source:** Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, Water Utilities, and SEWRPC.
### Table 44

<table>
<thead>
<tr>
<th>Water Supply System</th>
<th>Class</th>
<th>Estimated Area Served (square miles)</th>
<th>Estimated Population Served</th>
<th>Source of Supply</th>
<th>Number of Wells</th>
<th>Total Well Pumpage Capacity (mgd)</th>
<th>Well Aquifer</th>
<th>Number of Lake Water Intakes</th>
<th>Treatment Processes</th>
<th>Surface Treatment Plant Capacity (mgd)</th>
<th>Number of Storage Facilities</th>
<th>Total Storage Capacity (gallons x 1,000)</th>
<th>2005 Annual Average Pumpage (mgd)</th>
<th>2005 Maximum Daily Pumpage (mgd)</th>
<th>16-Year Maximum Daily Pumpage (mgd)</th>
<th>Spent Water Receiving System</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Brookfield Municipal Water Utility</td>
<td>AB</td>
<td>13.4</td>
<td>27,100</td>
<td>G</td>
<td>22</td>
<td>16.01</td>
<td>SD, SQ, F</td>
<td>--</td>
<td>H, P, SQ, PL</td>
<td>4.10</td>
<td>7.36</td>
<td>8.11</td>
<td>Fox River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delafield Municipal Water Utility</td>
<td>D</td>
<td>0.3</td>
<td>400</td>
<td>G</td>
<td>1</td>
<td>--</td>
<td>S</td>
<td>-</td>
<td>H</td>
<td>0.14</td>
<td>0.58</td>
<td>--</td>
<td>Bark River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Muskego Public Water Utility</td>
<td>C</td>
<td>4.7</td>
<td>10,000</td>
<td>G</td>
<td>9</td>
<td>5.51</td>
<td>SD, SQ, F</td>
<td>--</td>
<td>H, SQ</td>
<td>3.01</td>
<td>7.02</td>
<td>2.53</td>
<td>Lake Michigan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Oconomowoc Utilities</td>
<td>AB</td>
<td>5.2</td>
<td>13,600</td>
<td>G</td>
<td>6</td>
<td>--</td>
<td>GP, SQ, F</td>
<td>--</td>
<td>G, P, SQ, FL</td>
<td>2.283</td>
<td>1.94</td>
<td>4.08</td>
<td>Oconomowoc River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Pewaukee Water and Sewer Utility</td>
<td>AB</td>
<td>9.6</td>
<td>8,000</td>
<td>G</td>
<td>10</td>
<td>5.55</td>
<td>SD, SQ, F</td>
<td>--</td>
<td>H, P, SQ</td>
<td>1.78</td>
<td>3.02</td>
<td>2.44</td>
<td>Bark River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Waukesha Water Utility</td>
<td>AB</td>
<td>17.6</td>
<td>67,800</td>
<td>G</td>
<td>8</td>
<td>15.40</td>
<td>--</td>
<td>-</td>
<td>H, SQ, FL</td>
<td>15.27</td>
<td>7.76</td>
<td>12.87</td>
<td>Lake Michigan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Village of Butler Public Water Utility</td>
<td>C</td>
<td>0.8</td>
<td>1,800</td>
<td>G</td>
<td>2</td>
<td>0.94</td>
<td>GP, SQ, F</td>
<td>--</td>
<td>H, SQ, FL</td>
<td>100</td>
<td>0.91</td>
<td>1.76</td>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Village of Oak Creek Municipal Water Utility</td>
<td>C</td>
<td>0.5</td>
<td>1,800</td>
<td>G</td>
<td>2</td>
<td>0.94</td>
<td>GP, SQ, F</td>
<td>--</td>
<td>H, SQ, FL</td>
<td>100</td>
<td>0.91</td>
<td>1.76</td>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukwonago Municipal Water Utility</td>
<td>AB</td>
<td>2.2</td>
<td>6,500</td>
<td>G</td>
<td>4</td>
<td>3.64</td>
<td>SD, SQ, F</td>
<td>--</td>
<td>H, SQ, FL</td>
<td>1,000</td>
<td>1.66</td>
<td>1.66</td>
<td>Fox River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Village of Pewaukee Water Utility</td>
<td>AB</td>
<td>2.4</td>
<td>9,000</td>
<td>G</td>
<td>4</td>
<td>3.64</td>
<td>SD, SQ, F</td>
<td>--</td>
<td>H, SQ, FL</td>
<td>1,000</td>
<td>1.66</td>
<td>1.66</td>
<td>Fox River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sussex Village Hall and Water Utility</td>
<td>AB</td>
<td>4.1</td>
<td>9,800</td>
<td>G</td>
<td>5</td>
<td>4.39</td>
<td>S</td>
<td>--</td>
<td>H, SQ, F</td>
<td>1,000</td>
<td>1.66</td>
<td>1.66</td>
<td>Fox River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>93.2</strong></td>
<td><strong>234,200</strong></td>
<td><strong>93</strong></td>
<td><strong>73.37</strong></td>
<td><strong>--</strong></td>
<td><strong>--</strong></td>
<td><strong>--</strong></td>
<td><strong>--</strong></td>
<td><strong>56,839</strong></td>
<td><strong>29.33</strong></td>
<td><strong>54.29</strong></td>
<td><strong>--</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** N/A indicates data not available.

**a** The municipal water and combined water and sewer utilities are based upon the number of customers as follows: Class AB 4,000 or more customers; Class C from 1,000 to less than 4,000 customers; and Class D less than 1,000 customers.

**b** Population based upon Wisconsin Department of Natural Resources data base adjusted to 2004 Wisconsin Department of Administration Civil Division estimates and SEWRPC data, where appropriate.

**c** The following abbreviations are used:
- G = Groundwater
- S = Surface Water (Lake Michigan)
- SP = Surface Water Purchased (Lake Michigan)
- L = Local Water Intake

**d** The following abbreviations are used:
- SG = Sand and Gravel
- SD = Silurian Dolomite
- GP = Galena-Platteville Dolomite
- SH = Shale

**e** Make up code for treatment types, such as:
- CH = Pre-Sedimentation Chemical Addition
- S = Sedimentation
- C = Coagulation
- F = Filtration
- IC = Inorganic Chemicals
- SA = Spray Aeration
- CAT = Slat Tray Aeration
- M = Multiple Aquifers
- FL = Fluoridation

**f** Source: Wisconsin Department of Natural Resources, Public Service Commission of Wisconsin, water utilities, and SEWRPC.
Exhibit B
MUNICIPAL AND OTHER THAN MUNICIPAL, COMMUNITY WATER SUPPLY SYSTEMS IN MILWAUKEE COUNTY: 2005

SURFACE WATER SUPPLIED SYSTEMS
- CITY OF CUBA HARBOR WATER UTILITY
- CITY OF FRANKLIN WATER UTILITY
- CITY OF OAK HOLLOW WATER UTILITY
- CITY OF OAK HOLLOW WATER UTILITY
- CITY OF SOUTH MILWAUKEE WATER UTILITY
- NORTH SHORE WATER COMMISSION SERVICE AREA
- MILWAUKEE WATER WORKS RETAIL SERVICE AREA
- WE ENERGIES BADGER WATER UTILITY

MILWAUKEE WATER WORKS WHOLESALE MUNICIPALITIES:
- CITY OF WASHINGTON WATER UTILITY
- CITY OF WEST ALLIS WATER UTILITY
- VILLAGE OF BROWN DEER PUBLIC WATER UTILITY
- VILLAGE OF GREendale WATER UTILITY
- VILLAGE OF SHOREWOOD MUNICIPAL WATER UTILITY
- AREA SERVED BY PRIVATE WATER SYSTEMS USING GROUNDWATER. IDENTIFICATION NUMBER CORRESPONDS TO MARKER E

EXTENT OF URBAN DEVELOPMENT NOT SERVED BY PUBLIC OR PRIVATE WATER SUPPLY SYSTEMS INCLUDES URBAN DEVELOPMENTS IDENTIFIED IN THE REGIONAL PLANNING COMMISSION HISTORIC URBAN GROWTH ANALYSIS

SUBCONTINENTAL DIVIDE

NOTE: PRIVATE COMMUNITY WATER SUPPLY SYSTEMS ARE THOSE IDENTIFIED BY THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES AS OTHER THAN MUNICIPAL COMMUNITY.

Source: Wisconsin Department of Natural Resources, Wisconsin Public Service Commission, water utilities, and SWAPCC.

<table>
<thead>
<tr>
<th>Water Supply Facilities</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Systems</td>
<td>12</td>
</tr>
<tr>
<td>Surface Water Treatment Plant</td>
<td>5</td>
</tr>
<tr>
<td>Well</td>
<td>0</td>
</tr>
<tr>
<td>Water Softening Facilities</td>
<td>21</td>
</tr>
<tr>
<td>Reverse Osmosis Facilities</td>
<td>6</td>
</tr>
<tr>
<td>Private Systems</td>
<td>12</td>
</tr>
<tr>
<td>Number of Private System Wells</td>
<td>15</td>
</tr>
</tbody>
</table>